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<u>Landowner Experiences with Williams re: Pacific Connector Gas Pipeline Easements</u>
<u>Collected in April of 2016 AFTER the March 9, 2016 FERC denial</u>

<u>1. Jackson County, first contacted in 2006:</u> “We received pittance offers; ridiculous when you look at the impact the project would have on our property. Our plans were to retire to our property in Oregon. If the pipeline goes through, we will probably sell the property, and move someplace else. The project causes a huge negative impact to the property values; nobody wants to buy something with a project like this looming over it. I expect they'll then use this depressed evaluation to figure out our compensation. Really a crummy deal. This project has primarily caused us stress; but it has also essentially caused a freeze with the housing market. There is no way to sell a house under a threat like this.

The pipeline would cut through 2 acres of our property. They would be cutting down about half the trees on our property. We would no longer feel safe there, and the stripped land would be a constant reminder of the presence of the pipeline. They'll also be crossing the river directly upstream from us. This could destroy the benefits of our river access. We currently enjoy great rafting and fishing off our shores. The river is the lifeblood of our community. This WILL impact it in a hugely negative way and it could even ruin it.

This project has made us aware of the ability of corporations to ride roughshod over individuals. With minimal public benefit, but huge corporate monies, they may be able to forcibly take our property. Eminent domain is defined as: "the right of a government or its agent to expropriate private property for public use..." Um.... PUBLIC USE? This is a government-enabled land grab, under the pretense of creating jobs in isolated regions. THAT is not public use. AND what's more, Veresen isn't even an American company! It's downright crazy we'd allow this.

I expect our representatives to do their job and act for the good of the people.

<u>2. Coos County, first contacted in 2002</u>: We've had multiple offers, increasing values over the years, especially the last couple of years. Williams' representatives just stop by, uninvited. We've lived here over 40 years and have made improvements nearly every year to our property. It is beautiful, and we continue to make it so. This stress is terrible. We can't even imagine our property without the large conifers that are at least 100 years old. They are our watershed and trees will be removed. The pipeline will cut right through the year-round no-name creek that flows into a natural reservoir that is our water supply, and has been the only water supply since at least 1952. Our property will lose value, for sure. Would you buy a house with a big pipe buried 200-300 feet away? No. Neither would I. If this does happen, I will feel violated. The fact that these companies, Williams, Veresen and who else, can be allowed to use eminent domain for their private gain is appalling and un-American.

<u>3. Douglas County, first contacted in 2007:</u> Originally a representative came to our residence. We explained we were not interested in any negotiations as the route across our property takes far more land than they need. They didn't provide a better alternative and were disappointed in our stance. The offer was substantially less than reasonable and absolutely not fair. We were very disappointed in their position, this is the offer, like it or not. We have been held hostage waiting for them to get plans completed to the point of moving forward or going away. They have not seemed to sincerely care that we are being held in limbo. They feel if we would just give them our property along with all the rights they want they could get this done. They do not care how it affects our lives and property.

We have planned to have some sort of income producing crop on our land but have held off due to the unknowns of where we will be allowed to grow something and when it might happen. This has been very stressful being held hostage by a company who does not have your best interest at heart. It is hard knowing it is about the dollars in their pocket and not the impact on us as an affected landowner.

We have tried to sell our property; however, this pipeline and all the unknowns always comes up and potential buyers are no longer interested in purchasing. Nine years is too long for this company to have held us at bay. Based on input from potential buyers and our inability to use the property for the purpose we were intending the value will decrease. Their route encompasses far more property than necessary. This should not be allowed. They should not be able to zig-zag across our land and driveway based solely on their desire to do so. This project has affected the way we look at the dealings with landowners for corporate gain and not for the landowner themselves. Williams should never be allowed to run over landowners who in good faith follow the land rules and just want to be allowed to use the property they purchased in the manner they intended. We should not have to worry about the safety of ourselves or our neighbors just because some corporate company is looking to make big profits off of us while offering to pay the bare minimum. I truly hope FERC stands up to this company and denies this permit once and for all sending a message to this company how wrong it is to treat landowners so horribly and dishonestly and having total disregard for their safety and well-being. This has gone on way too long.

4. Jackson County, first contacted in 2004: Initially Williams surveyors just showed up and began placing orange flagged stakes to the north of our property and ignored me when I inquired who they were and what they were doing. My husband and I were just settling into our dream home we built. Another time, we were told we'd have use of a generator for all our household needs for the duration of the project - this would include the homes interior fire protection system - when our underground power lines are cut for Williams access to 'improvements' on Old Ferry Road. I was very disappointed when I overheard a conversation between Dave Randel (PCGP route coordinator) and Rex Owings (I don't know if he is still w/PC) saying early on in the process that, "Can't wait 'til we get these damn permits so we can do what the hell we want." I believe it was Mr. Owings who made the statement. We had just moved into our retirement dream home in June '06 which was planned many years in advance, designed and built with natural view appeal in mind - all electrical and cables are underground and came at considerable expense as it was necessary to connect at a neighbor's power supply, 776 feet away. We relocated to this beautiful state, and quite painfully came to realize that this passive solar custom built home would indeed lose considerable resale value when we spoke to realty agents last December. My marriage has been frayed considerably and I do believe would be in great jeopardy as I would have to move, while my husband says he would not. You see, I have done all the research on Williams Company and their numerous safety incidents and violations pepper a laundry list for this company. Having worked for an air and land use agency for San Diego County in permit processing part of my job was research in working with inspectors and compliance. This pipeline would not only be the ROW for the pipeline, but numerous TEWAs -temporary extra work areas- would remove vital forest/soils erosion control methods on the steep, rugged terrain to the east, north and west of our home. Much needed shade would be lost creating a heat island effect bringing with it a considerable dust bowl to this drought stricken area in So. Oregon. I do not wish to become bitter, but this has been a cruel and lengthy process. Much sleep has been lost and I know I have Traumatic Stress Disorder as all my history, relations, discussions either start with or ultimately end with being defined as an affected landowner of PCGP.

This does NOT impact mere landowners - this will forever change Oregon. Her rivers, waterways, fragmented forests, and air quality will suffer irreparable damage. Renewable industries such as Tourism and Travel will be greatly impacted.

5. Jackson County, first contacted in 2014: When I purchased the property in Oct 2014 I was told that the pipeline went only through the far north border of my property (80 acres).

I realized that Williams was continuing surveying on my property, without my permission, which I then stopped. Williams Reps lied and said that no one had accessed my property, but there were new pink and blue survey ribbons all through my property, despite the No Trespassing signs.

Williams Reps persisted in meeting with me to give me what they called an "outstanding offer." When the Williams Reps visited me at my property they gave me a book that showed the impact to my property which they said was "minimal" and tried to get me to sign the lifetime offer of $69,000.

As my boyfriend is a general and engineering contractor he asked key questions and reviewed the maps of Williams impact. It came to light that Williams wanted a temporary easement of roughly 1500' in length to lay out the pipe including a football size bore pit at the current entrance to my property. Williams would have to give me temporary ingress/egress to my own property at another location. They would remove all of my trees, damage my irrigation, fences, and impact the operation of my FAA approved airport. Williams would "temporarily" ruin about 40 acres of land during construction on my property. The wildlife on the property includes, bear, coyote, wild turkeys, deer, and cougar.

The damage to the trees, seasonal creek, FAA approved airport, wildlife, and my privacy would forever reduce the value and beauty of my land. Williams lied to me about the impact to my land which would be used as a key construction site for boring under the Rogue River.

Williams Reps lie to fit whatever message they are giving at that time. They are not being truthful on the number of permanent jobs to Oregon residents. They are not being truthful on the impact to the land, people, water, and wildlife.

This issue has caused me considerable emotional stress as I bought the property with an understanding of extreme minimal impact to my land and then found out that Williams had lied and that my property is a key construction site. They would remove all of my trees, damage my irrigation, fences, and impact the operation of my FAA approved airport. Williams would "temporarily" (permanently) ruin about 40 acres of land during construction on my property. The damage to the trees, seasonal creek, FAA approved airport, wildlife, and my privacy would forever reduce the beauty and value of my land and the surrounding environment.

They have impacted the peace and quiet that a homeowner deserves on their own land by attempting to use eminent domain for corporation gain.

6. Douglas County, first contacted in 2009 or earlier: They were clearly unhappy when we would not allow a survey. Only offer was through US mail. The value of our property was decreased with threat of pipeline. We are unsure as to how to proceed with timber management with all of the unknowns.

Certainly there has been an emotional toll. We have spent many hours writing letters, emails, etc. to government officials from local to federal level. At times the situation seemed insurmountable.

Our family continues to be very opposed to the Pacific Connector Gas Pipeline. The use of eminent domain to force us to agree to Pacific Connector terms is wrong! The pipeline's projected route impacts our most productive timberland. Williams has initially offered $2,443.72 for the land involved, noting that 2 acres of our 48 acres were impacted. This small payment is supposed to compensate us for permanently bisecting our property, decreasing its value, and forcing premature harvest of trees on the easement. Of course there will be value associated with the marketable timber on the easement, but future harvest will not occur on the easement, again lost revenue. As we approach retirement, we had hoped to use prudent selective cutting of timber to help pay for expenses and medical costs. This will not be possible if the pipeline is constructed.

In addition, we have serious concerns regarding the pipeline integrity, potential earthquakes, and wildland fire. It is our understanding that the US Army Corp has asked for a reevaluation of pipeline depth. Our family is very familiar with the environmental and economic consequences of wildland fire because our son has worked for the US Forest Service as a wildland firefighter for 20 years. We do not want to see our community or anyone's son or daughter put in harm's way in the name of corporate profit.

In summary, earthquake and fire safety as related to the pipeline should be reexamined. Also, eminent domain should be reserved for projects that truly support the good of all citizens. It is a shame that a Canadian corporation and its associates will make billions of dollars at the expense of the environment and personal expense of small landowners in southern Oregon.

7. Jackson County: Williams has been pestering me, including a hard sell and had someone fly out from Utah to walk the property with me, for at least 5 years, It could be longer. Williams has had a number of southern dialect managers contact me over the years. They flew Rex Owens out at one point to try to convince me to support their private enterprise. The hard sell has become more dug in, they made more than one offer, increasing it when we refused. They tried to convince me the pipeline is a good project, which is absurd. It is a private benefit, not for our community or our State. They do not get the message enough is enough. We do not want the pipeline and they should not be given another opportunity to pester me even more, then take me to court and take my property.
We have a meadow at the top of the two tax lots we purchased to build on. I will not be allowed to build as the pipeline will take the potential home site.

Because of the longevity of this hard sell project and their persistence for only their financial gain, we have had to contribute to organizations who are trying to protect the landowners.
In addition, just the stress of having calls, newspaper briefings, political involvement and more cost added to our government for Williams is absurd and costly. They need to be told NO MORE.

I read the easement requirements, which basically take the only meadow in our property and make it unbuildable, unusable and can allow ATV's and hunters from neighboring BLM to access my property, making me and my children less safe. Williams has persisted over the years to try to buy off landowners, and try to convince our communities and state that there will be many jobs in the future. It isn't true. I specifically requested numbers of jobs once the work is done and all the workers return to Georgia. It is a pittance. They are self-serving, will leave an environmental disaster in their wake based on their history in other states. The Pacific Connector is unsafe, and is self-serving to fill the bank of William's account, not offer a long-term investment for our communities or State of Oregon.

8. Douglas County first contacted in 2007: I received a low ball offer, Williams was on my property without permission. First they said the gas for import, then they changed it and now want to export it. I want to build on the top of my property but can't until this issue is resolved. This is a huge emotional stress because Williams has threatened me with eminent domain. I also have been informed by a real estate agent that my property value will drop 1/3 if the pipeline does cross my property. I feel my private property rights would be violated and compare it to someone opening my front door and walking through my living room and out my backdoor anytime they felt like it. This is a foreign corporation, using my property as a thoroughfare, selling fracked gas to Asia for a huge profit and threatening me with eminent domain if I don't cooperate with them. I fail to see the common good requirement of eminent domain when no one in Oregon has any access to the gas.

9. Douglas County: The Pipeline is supposed to go just in front of our property, we will have to drive over it to enter our property. Williams put ribbons in our trees without our permission. We want to sell our tree farm, but we have to disclose the Pacific Connector and nobody is interested now. We have quicksand and with too much rain we will have mud slides and the pipeline will be a bomb in the ground. With a fire nobody will be able to come in time to turn off the substations. We never will get the price for our property that we should get for being a tree grower of the year in 2010.

10. Coos County, first contacted in 2013: I have not spoken to a single Williams representative. Nor has anyone made any effort to contact me in person to speak in regards to our property. Not that I want to speak to anyone about it. An initial offer of $1,400 was made along with an offer of $40,000. Williams has not made any effort to change the route based on the concerns we have.

We have a large herd of cattle, and no one has been working with us to figure out where out cattle would go if the pipeline were to tear up out pastures. The pipeline is slotted to be installed by our home, and no one from Williams has made any effort to manage our concerns about having an underground "bomb" by our primary residence.

We run a small cattle business, and our business would be compromised by the lack of ground for our herd. Our home is our retirement plan, and the pipeline would significantly reduce the value of our 26-acre property. We would be unable to run heavy equipment over the pipe, which would compromise our ability to expand and use our property to its fullest capacity. We also wanted to build a second home up on our hill, and we would not be able to on top of the pipeline. The pipeline would cut down a forest that we would have left, and it could cause landslide/erosion damage. As a concerned citizen and property owner, I have had anxiety and stress about the pipeline. I am worried about the impact it would have on my property, and I have to spend countless hours writing letters and scanning my property for strangers. I have had to take time away from my family to intervene and write letters, spending time and energy on efforts. I am worried about how the construction will impact my family, and how the construction will affect my young children. I am worried about strangers on my property, undue noises from construction, and all of the environmental damage. I am also worried that the pipeline will leave me with not enough feed for my herd of cattle. I am also worried about damage to the slough and how the displacement of the ground would affect overall ground stability.

Our property, the serenity, the ambiance, and the security would be destroyed. We are small farmers and we enjoy what our property brings us. Our security, peace of mind, and our property would be destroyed all for the financial gain of a corporation. Pacific connector has added stress and has threatened the security and safety of our family. They want to push themselves onto our land for their gain.

11. Jackson County, first contacted in 2006: I have gotten three offers. The first offer was ridiculously low. I have not had much contact with Williams because I have not wanted to show any support for or provide any support for their project. And had no intention to sell them an easement. A few years ago I had intended to sell the property. After talking to real estate agents it would almost be impossible to sell the property because I would have to disclose what is going on with the pipeline and the property. No one would want to buy the property unless it was deeply discounted. Then if it [pipeline] is approved I will have to have an easement that reduces my property that I can use by about 25% in accordance with Williams' estimate. And I would be stuck paying property taxes on what I cannot get rid of short of abandoning the property. The impact on my property would make it virtually worthless. Williams is only interested in purchasing an easement. The odds are the easement will cut the property in half. The property is on the East side of the Rogue River. It is where the pipeline will cross under the Rogue River. The property is pie shape with the large end on the river the property lines moving in to an apex inland. The best odds are the pipeline is going to go through my well or septic tank or approved building site or any combination of the three, I figure best it will go through two of the fore mentioned sites. I cannot use my property to build to the North because of other existing restrictions. Also, because of the restrictions on what can be done on the pipeline easement it will leave me with very little unapproved site area in Southwest corner of the property. It will affect my land use by more than 25%. I estimate more than 50% but more likely around 75% of the land will not be usable. I am not sure a living structure will be able to be even put on the land because of lack of usable land. Therefore, I will be responsible for paying taxes on land I cannot use making the property useless. This will lead me to probably abandon the property. Only fair thing they can do is purchase the property at fair market value.

It has been a long and stressful ordeal to deal with not knowing what is going to happen to the property over the last ten years. Because I have not been able to sell it I have had to pay property taxes on something I cannot even begin to get rid of or use or want to put out expenses on something that might be condemned. How much longer does this need to go on?

Pacific Connector actions is causing me not to be able to sell my land and if the project is approved it will make the property worthless. The pipeline does not benefit anyone except Pacific Connector and threatens the Rogue River with possible leaks.

This is a project that is not necessary. Exporting gas in not something we need to do in this country and they also have no foreign buyers. It will not really benefit the local community or the country it will only benefit Pacific Connector and their backers. Definitely will not benefit the landowners. I felt 10 years ago that PC just wanted to get an easement for the ability to use it, if not for the pipeline, to use it for power lines, fiber optic lines or whatever. To sell their ownership in the easement and get a financial benefit on the back of the landowners. Last year I found out PC, yes, they could use the easement for other things besides the pipeline and sell space on the easement. I do not believe PC is really interested in just a pipeline but a way to get the easement for future undetermined projects and financial gains at the expense of others.

12. Douglas County, first contacted in 2007: Williams has lied to us more than once in reference to questions about our property and the pipeline potentially crossing it. We attended a meeting at UCC sponsored by Williams. The representatives had very arrogant responses to our questions. We were given a written offer, which was really low considering how our land will be affected if we ever do want to sell. Will we even be able to sell with people knowing there is a high pressure pipeline on our property?

I have wanted to move several times because of the stress this has caused and will continue to cause. However, I have heard of other landowners who cannot sell because of the possibility of the pipeline being built on their property. We bought our property when the market was high. The price has never recovered since the downturn. We will more than likely lose 1/3 of our properties value when we will eventually sell if the pipeline is constructed. It has also kept us from building a structure on the most beloved and beautiful spot on our property because the pipeline would run right by it. The 100-foot clearance the pipeline would clear will ruin the beauty of the location and deem it not a desirable location any longer.

We have invested a lot financially in fighting the pipeline from happening. We have spent countless hours working on protesting, meeting with other landowners and environmentalists on how we can stop this whole process from proceeding any further.

We already know we will lose 1/3 of our current value when we go to sell. Plus, there are no guarantees the property will even sell. The pipeline will also run in front of our house on our neighbor's property. This is where we have our most beautiful view from our deck. Instead of trees on the hillside from our deck, we will see a 100-foot-wide area of clear cut. This also is going to affect the aesthetic value to our home and view. We bought this property prior to retiring in anticipation of having a beautiful and peaceful retirement setting. it has been far from peaceful, and the beauty will be lost too if a pipeline were to be constructed here.

This pipeline is not for the common good of Oregon. No one in this state will receive natural gas from this project. It does not benefit our state and therefore our country. Eminent domain should not even be a factor in the progress of this pipeline. Every resident of this area would feel exactly the same way we do if this high pressure pipeline were proposed on their private, personal property. We do not want the pipeline! It is not fair that this project is being forced upon us so a corporation can make billions of dollars at our expense and loss!

13. Douglas County, first contacted in 2005/2006: We have received no offers and Williams was unwilling to make any changes to the alignment to avoid our salmon habitat restoration work in Fate Creek. It is affecting our retirement planning. This has been the hardest part. For over ten years we having been living under the threat of this pipeline going to be put in very near our house and run through our pastures, as well as destroying our salmon habitat work with the local watershed council. We have spent much time, money, gasoline and emotional effort to try to protect our land. We are even on their Williams' plans to use our driveway and pasture for a huge staging area. Their talk of appropriate compensation is laughable.

The pipeline would destroy our peace of mind. Since they started this process there have been numerous explosions from leaking pipelines, some of which were Williams'. We have had experience with what their word means in Douglas County itself where they have caused contamination of a creek due to improper installation of a smaller pipeline. They are offering no dollars to train local fire personnel along the route to be prepared for dealing with such a fire which could set off a catastrophic fire in Oregon's timber lands.

It has been a huge stress for over ten years not knowing if we will be living with a 36" high pressure natural gas pipeline going in a curve around our house and installed to lesser standards than in more populated areas. Particularly we are upset about their lack of concern for Douglas County's major resources: fishing and timber.

14. Douglas County, first contacted in 2007: We did meet with one of Williams's Company's land agents after they repeatedly called, mailed and made appearances at my personal residence. Because my teenage daughter was concerned about the strange man that kept knocking at our front door when I wasn't home, I agreed to meet with the representative. At that time, the land agent presented me with a notebook that showed detailed aerial photographs of our land along with an offer for the easement. I was told by the land agent that the pipeline was a "done deal" and I would have to accept their offer or face a protracted legal battle. We were not the least bit interested in selling an easement but I did look at the offer and was underwhelmed to see that it was an offer for a permanent easement that would directly affect seven acres and indirectly affect many more. The total amount offered was slightly less than $3,000. That calculates out to be roughly $429 per acre. Williams Company's offer is supposedly 25% of the value of the land because, in theory, we still have access to the land. However, as the land in question would be best suited to either timber, Christmas tree production or hazelnut production, the land would no longer be able to be used to its highest potential. If I would have been interested in garnering an offer that was more in keeping with the value that the easement represented, it would have been up to me to bear the costs of hiring professional consultants and my own attorney in order to try to negotiate to a more equitable offer. I much preferred the idea of using my time and energy into pursuing ways to utilize the land to its utmost potential.

Ever since the threat of losing part of our land, we have deferred making decisions for improvements to the property and concentrated our efforts on fighting the Pacific Pipeline. We've attended land use meetings, county commissioner meetings, met with elected officials and filed Land Use appeals and spent thousands of dollars to fight this project. Any plans we've discussed about making improvements on the property have been put on hold until we are sure that improvements for the property won't be demolished if the pipeline goes through. In the past, we have hired a timber consultant to advise us on how best to manage the part of the property that is timberland but we are holding off on further consultant expenditures until we are sure this pipeline is in fact a dead deal. Until we can be assured the pipeline proposal is finished, we are holding off on making any additional investments in the property. Basically, we have put everything on hold until this goes away.

Before we were made aware of the possibility of having the Pacific Connector high pressure pipeline cut a swath through the 153-acre parcel that has been in our family for years, the term eminent domain meant a tool used when land had to be purchased for the common good, like a land parcel needed to build a school, or maybe the slicing off of a bit of land so a highway could be widened or an unsafe corner straightened out. The concept that a corporation could use eminent domain purely to push through a project that would benefit stockholders of a private corporation seemed entirely foreign (no pun intended) to us. We have spent endless hours attending land use meetings, board of commissioner meetings, writing letters to editors, meeting with elected officials and attending protests. All of this is done in addition to our daily professional responsibilities and our household and family responsibilities. All of the time we spend on fighting the pipeline is not time that we planned on dedicating to this battle: we did not choose to pursue having a pipeline cross our land; we did not seek this out. Before this battle was thrust upon us, we were unaware of the Williams Company or Vereson, Inc. We have been small woodlot owners, farmers and caretakers of family homesteads, trying to be good guardians for the land that has been passed on to us from prior generations. We could not have imagined that we would have had to expend so much time and money to hold onto land that we already own.

In our case, the pipeline makes a diagonal swath through our property. It will cut through reforested land that we had replanted and maintained in 2007, tear up drainage systems we've installed and cross two small fish bearing streams as well as the Coquille River. We have made thoughtful decisions about timber harvesting, replanting and maintaining habitat for endangered species. If the pipeline goes through, all of those decisions will have been for nothing.

If allowed, this project would inhibit landowners in economically depressed areas from making decisions about how their land could best be used. If the pipeline goes through, local land owners will be severely restricted in what crops they can produce on their lands. Those that are most suited to the lands in question will not be allowed along the path of the pipeline.

Southern Oregon has been economically devastated for decades because their economy was dependent on a product whose harvest resulted in negative impacts to the environment. As more was learned about the negative impact of logging, the change in political and social opinions made logging restrictions even more stringent and local economies suffered. It makes absolutely no sense to tear up even more land in Southern Oregon for a fossil fuel project when the political and social opinions are already swinging back away from utilizing fossil fuels. It is the economic equivalent of tearing up forest land to plant fields of tobacco plants right after the Surgeon General determines smoking causes cancer. You are pouring money into and irreparably damaging lands for a project that is already on its way to being obsolete even before the first shovel of dirt has been turned.

15. Douglas County, first contacted in 2013: We have received no offers. We have received form letter types of information in the mail. We have observed signs of them trespassing on our property by the marking of trees, etc. along the proposed route. We have also caught them trying to gain access through a locked gate to enter our property. We have written to the company and asked that they find an alternate route and received no reply.

Our place was a logged over mess with trash everywhere when we bought it. We took hundreds of appliances to the landfill and planted over 10,000 trees, it has taken us years to heal this land. It is fundamentally wrong that our American dream can be sacrificed through eminent domain so foreign companies can profit from our struggle? I do not understand any rationale that suggests a temporary paycheck for a laborer from California is more valuable that our 40 years of hard work; trust me, we will do whatever it takes to protect our home. The pipeline crosses both of our legal parcels thus reducing any opportunity to sell or develop either of the parcels. We are hesitant to invest in any further improvements as it would be a waste of time and financial resources if the pipeline is approved across our land. We will be forced into eminent domain proceedings as we are not supportive of the Jordan Cove or Pacific Connector projects. With other landowners we have spent over $50,000 in court trying to stop local permits in Douglas County. I average more than 40 hours a week researching and responding to legal and public comment opportunities.

I cannot begin to describe the torment and angst associated with these past many years and the unknowns surrounding the pipeline. We have been told by area realtors that if we desired to sell our property we would have to disclose the pipeline threat thus reducing our sales opportunity and price. The pipeline has created serious health threats for me in terms of emotional stress. I have developed a sleeping disorder and am currently under a physician's care for gastrointestinal issues resultant of the stress related to the Pacific Connector Gas Pipeline issues I am deeply involved in. The pipeline has intruded on every aspect of our lives and caused marital stress and affected our ability to devote the necessary time to developing our small businesses due to time required to stop the Pipeline project and Jordan Cove.

This pipeline would destroy our vision and dream for creating a personal and wildlife sanctuary as it will cut a scar across our wooded and forested land. Our privacy will be intruded upon with the ability of the pipeline owners and operators to have access to our property because of the easement. We would likely not be able to develop a residence on one of the parcels for our children as the pipeline will cut our property in half reducing our ability to access the second parcel with heavy equipment for fire suppression, fire fuel reduction, road maintenance and the residential construction. We have planted more than 10,000 trees and devoted more than 15 years to rehabilitating this land and to have it virtually stolen from us by our own government for private and foreign corporate gain is unconscionable.

16. Coos County, first contacted in 2010/2011: Originally they [Williams] were really not talking about money, they just said they were going to do it. We just told them the reasons we did not want to have it on our property at all. They just acted like it didn't matter what we wanted.

We have worked for twenty-three years cutting brush, planting, fixing up old buildings, remodeling our home, improving every aspect of our property and building a business. This is our dream home where we want to live the rest of our lives. It has been very upsetting when you spend so much of your life working on a property only to have Pacific Connector treat you like you don't matter. We have a business and would not think of forcing our needs on someone else. It would be like us clearing several acres of each of our neighbor's property to give us room to turn our equipment around and having no concern that the property belongs to someone else. Oh and we would continue to use it indefinitely! We would gladly give them $150.00, and tell them that us having continued use of their property would not affect their ability to sell their property if they wanted to. Yes, it does sound ridiculous when an individual says they are going to do this. If it were a hospital, or school it would be different. It is because of sheer greed and a foreign company at that. We worry that it will affect our well water supply. It is an area where it could easily slide, and we have some experience with this so we have good reason to worry. My husband and I could not stay here with a 36" pipeline so close...and you know they cannot be sure that it would be safe. That is even if there is never an earthquake! We know there would be no chance of that on the Oregon coast. We never ever wanted to leave this property we have worked so hard for. This is our dream home and property. It is worth everything to us and we would never willingly sell because it would break our hearts. It should be our right in this free county. We should not allow a foreign country or company to do this.

17. Douglas County, first contacted in 2006/2007: This letter is regarding my mom and step-dad. Their property would be greatly affected if the Pacific Connector Gas Pipeline is approved. I'm writing this as the daughter of a woman who has gone through so much stress and grief over the fact that Jordan Cove has proposed putting a gas pipeline directly through their property – all in the name of eminent domain. It infuriates me that over the last 10+ years they have had to continually stress and worry over what is going to happen to their property. Can you imagine how heartbreaking it is as her daughter to see your mom shed so many tears over something that is out of her control? She is 77 years old and has been having to live with this fear way too long.

The reason my parents are not in approval of the pipeline has nothing to do with the amount of money they were offered because no amount of money could constitute putting a dangerous gas line under the ground on their property! Not only is it a danger but it will also tear up her property to a degree that it will never look the same again. Anyone who knows my mom knows how much time she spends in her yard making it look beautiful. They have a tree lined driveway for which all of the trees were planted at the same time and are the same size and height, they were planted 30 years go.. This project would take out some of those trees and yes – they were told new ones would be planted but we all know what that would look like with the mismatched tree sizes. It will take out a landscaped area that is full of beautiful plants that she has groomed over the years. This pipeline will go up and over her property removing forest trees that have been there forever and disturbing the wildlife it is home to. She actually lives on a mountain so there are many things which are in their natural habitat that will be taken out including a wildflower patch of lady slippers, lambs tongues, fox gloves etc., that we have enjoyed ever since the property was purchased all those years ago. Lady slippers bloom once a year and don't last long so Mom takes her grandkids and great grandkids as well as their friends out to the area they are located to see them at the right time as not to miss them. Lady Slippers cannot be transplanted.

In March when I learned that FERC had denied the pipeline I immediately got on the phone to let her know the WONDERFUL NEWS. This time she cried tears of joy! It was a cause for celebration! My heart was jumping with joy as I heard how excited and relieved she was at this news! My thought was that my mom could FINALLY HAVE PEACE and I was and am so grateful that you denied the pipeline's request. Soon afterward the elation that we felt was stomped on as we learned Jordan Cove was going to appeal FERC's decision and continues to move forward with this project. My immediate thought was …. Is this hell ever going to end???

I want to thank FERC for denying this project and I plead with you to stand firm by your decision to not allow this travesty to move forward. Let's end this once and for all and bring peace to those who have been negatively affected by this for so many years.

Mom's letter to FERC:
To whom it may concern, We searched for the perfect property to retire and live out our golden years and we finally found it approximately 30 years ago. It was bare land to begin with and we worked very hard to put in the road, electricity, water, sewer, and we built our home on top of the mountain with a huge front yard. We planted it all in small wood lot trees. I can look out my living room window and see lots of wild animals such as deer, turkeys, pheasants, quail, rabbits, red tailed hawks and even once saw a cow elk walking across my front yard one morning. I watch the yellow school bus meandering up Rice Creek to pick up the kids. One day we heard a tap tap tap noise and looked out to see a man driving surveying stakes on our property all the way across our big yard. We told him to leave and he said he didn't have to, they had eminent domain. We have been fighting them ever since. The proposed 100' swath with a 36" pressured pipe will come up our road and go across our front yard where our children, grandkids and great grandkids have picnics, graduation parties, birthdays and much more. They also have their swing set, trampoline; have a power wheel track where they ride their power wheels, 4 wheelers and bikes. We love to relax in the yard and watch the birds by day and star gaze by night. They also propose 2 big staging areas to be used while they are working. We picked this property to build our home because of the high ridge and we can see the beautiful surrounding mountains. We were told our property was chosen because they like to stay on the ridges when they can. We have been told that after our property is torn up to put in the pipeline, they will put it back like it was. How would you like your sweet babies to share their yard with a monster? I refer to the pipeline as a monster and I love my family far too much than to take the chance. I propose to stop the use of my property via eminent domain for its use on the pipeline.

18. Douglas County, first contacted in 2005/2006: We did get an offer for which we were not satisfied. No amount of money would justify them coming onto our property with the "monster"!!! They were rude when we tried to explain why we would not allow them to rape and pillage our property. I don't want to hear from them on this matter again. They will not come onto my property!!!

The pipeline hovering over my head has prevented us from doing any further improvements on our property. We had plans to put in a pool in the same location that pipeline is proposed to go through. This is all on hold.

We searched for the perfect property to retire and live out our golden years and we finally found it approximately 30 years ago. It was bare land to begin with and we worked very hard to put in the road, electricity, water, sewer, and we built our home on top of the mountain with a huge front yard. We planted it all in small wood lot trees. I can look out my living room window and see lots of wild animals such as deer, turkeys, pheasants, quail, rabbits, red tailed hawks and even once saw a cow elk walking across my front yard one morning. I watch the yellow school bus meandering up Rice Creek to pick up the kids.

One day we heard a tap tap tap noise and looked out to see a man driving surveying stakes on our property all the way across our big yard. We told him to leave and he said he didn't have to, they had eminent domain. We have been fighting them ever since.

The proposed 100' swath with a 36" pressured pipe will come up our road and go across our front yard where our children, grandkids and great grandkids have picnics, graduation parties, birthdays and much more. They also have their swing set, trampoline; have a power wheel track where they ride their power wheels, 4 wheelers and bikes. We love to relax in the yard and watch the birds by day and star gaze by night. They also propose 2 big staging areas to be used while they are working.

We picked this property to build our home because of the high ridge and we can see the beautiful surrounding mountains. We were told our property was chosen because they like to stay on the ridges when they can. We have been told that after our property is torn up to put in the pipeline, they will put it back like it was.

How would you like your sweet babies to share their yard with a monster? I refer to the pipeline as a monster and I love my family far too much than to take the chance.

I propose to stop the use of my property via eminent domain for its use on the pipeline.

I have been under continual stress since the first day I was notified of this project. It is on my mind continually and I can't really feel joy to the level I once did because I have this pipeline heavy on my mind. I have shed many many tears over the years. I'm 77 years old and I should have had to live the last 10 plus years of my life worrying about this pipeline.

Not only is it a danger but it will also tear up my property to a degree that it will never look the same again. Anyone who knows me knows how much time I spend in my yard making it look beautiful. I have a tree lined driveway for which all of the trees were planted at the same time and are the same size and height, they were planted 30 years go.. This project would take out some of those trees and yes – we were told new ones could be planted but we all know what that would look like with the mismatched tree sizes. It will take out a landscaped area that is full of beautiful plants that I have groomed over the years. This pipeline will go up and over my property removing forest trees that have been there forever and disturbing the wildlife it is home to. I actually live on a mountain so there are many things which are in their natural habitat that will be taken out including a wildflower patch of lady slippers, lambs tongues, fox gloves etc., that we have enjoyed ever since the property was purchased all those years ago. Lady slippers bloom once a year and don't last long so I take my grandkids and great grandkids as well as their friends out to the area they are located to see them at the right time as not to miss them. Lady Slippers cannot be transplanted. I could go on and on ....

19. Douglas County, first contacted in 2009: We allowed the Williams' archeologists to come on our property to do a survey. We were paid $1000. The offer of the right to put the pipeline through our property was $2900. Not even close to what it will cost in terms of the damage they will do.

We were considering planting filberts on a portion of our land. The pipeline would cut through the field. We would also loose other old fruit trees that are still bearing fruit.

Just the stress of the unknown and the bullying from the pipeline not only to us personally but in the media as well. We had an engineer from Williams show up unannounced on our doorstep wanting to look at the route. We told him no. He said he would not want it going anywhere near his property. He was from back east somewhere. We think it was North Carolina. Anyway he said that the lines back there were starting to fail and eventually they will all fail. It will be devastating. This is a family farm that has been in the family for 100 years.

This pipeline would also be catastrophic to the wildlife here and in the Coquille River that runs through the property. We have, in the 12 years that we been here, observed wildlife ranging from elk to turtles. We have cranes, kingfishers, muskrats, beaver, cutthroat trout, turtles, deer, fresh water mussels and many more species. There are also lady slippers growing here and Canadian geese visit each year right in the pipeline path.

As land owners we have fenced the river to keep livestock from causing havoc to the fish and wildlife. We cannot cut trees for 100 feet next to the river to protect the fish. But suddenly a foreign company comes in wanting to sell our children and grandchildren's natural resources to make money for the private sector and all those laws are ignored? This makes no sense and is infuriating to me as a citizen and tax payer. This will not only effect my property but will devalue most property in Camas Valley. This is not just a gas line, but an enormous high pressure system. Any failure of this line will cause devastation for miles. And we are continually being warned of an impending earthquake just off the coast. This pipeline application has gone on long enough. Holding landowners' hostage for 10 years is ridiculous. Please tell the Canadians that in America no means no. If they want this pipeline so badly put it through Canada.

20. Jackson County, first contacted in 2009: I went to some of the earlier meetings and saw that they {Williams} were just a bunch of liars saying anything to get us to cooperate so I told them not to contact me anymore, but I still get too much in the mail. The pipeline would open up my property to motorcycles and four wheelers which is a problem for me around here. And I would be driving over it every day hoping it does not blow up. It's the environmental damage to Oregon and the places where the fracking is done to get the gas is the worst part I just don't like the idea that a private company can steal people's land for their own gain.

21. Jackson County, first contacted in 2006: Initially, I was told the pipeline would transport natural gas to be refined/produced for domestic use. While I didn't like the idea of my property being torn up, or possibly having limits on my use of and enjoyment of it, I thought it would help make us 'energy independent' of foreign oil, etc. I felt it was akin to a community needing a new prison but everyone saying, "Not in my backyard." Well, this pipeline would certainly be in my backyard, but it would have helped me/us/the USA to be more self-reliant. The representatives were gracious. So I gave permission for Williams to access and survey my property. The first offer was a ridiculous pittance. The next two offers grew somewhat, but even the most recent offer does not rise to a level I deem fair compensation.

I anticipate greatly diminished property value. I have already been harmed by the "tying up" of my option to sell at the value my property once had. In the time we have been waiting for some resolution, the market dropped over 50%. It is now rising but has not regained its value. If I'm forced to yield an easement there will be portions of my (8.6 acre) parcel I will be forestalled from landscaping as I would like for privacy and enjoyment. My parcel has 330 feet of Rogue River frontage--a valuable parcel if not marred by the pipeline. The question uppermost in my mind is. "Who would want it if the pipeline goes through?" They've offered a fraction of what I have lost in value. I purchased this property as a place to retire. I've got a good well, electricity and phone to the property, a storage building on it, septic, and when this matter began 10 or so years ago I realized I should hold off further development and not throw away good money. I may end up with a parcel nothing like what I could have had; and worth far less.

I've paid nearly $20,000 in taxes, and hundreds in utilities, on property I would have sold long ago. I've felt hamstrung by waiting, waiting, waiting for a final outcome. I also fret over how long it will be before the property reaches the value it had in 2006, if ever! Even if the FERC decision to deny permits is upheld, I can't recoup the years of waiting, nor the investments I might have made if I could have sold the property without a cloud of doubt hanging over it.

It will cross right at the land entry to my acreage and tie up 15-20% of it, severely limiting the appeal of the entry. The loss of mature trees there cannot be made up; the present seclusion will be gone. In addition, it may require relocating my well and utility lines. I think the septic is far enough away to be 'safe' from disturbance.

There have been years of waiting in limbo, unable to realize the enjoyment of my investment; unable to make liquid said investment and realize any gain thereof; and of feeling powerless to do anything about it. I've been held captive, and whether it's built or not, I feel that both financial security and peace of mind has been stolen from me.

22. Douglas County, first contacted many years ago unsure of date:
An unfair offer was made; however, I do not want to sell them an easement. If a pipeline is built it will definitely change my plans for my property. I have been impacted with a lot of stress and a lot of my time is taken reading to try to determine what they are up to, what they are doing as well as read their constant propaganda.

The current planned route of the pipeline would go through the septic system. At least part of the system would have to be moved; I don't know whether that can even be done, or if it can, at what cost. For Pacific Connector (or ANY company) to be able to use the threat of eminent domain for a project like this--one that is NOT absolutely essential--is just plain WRONG.

23. Coos County, first contacted in 2007: Williams has been a nuisance! I have gotten 3 offers, ranging from 6k to 25 k. They have been my on property, without my permission (putting surveyor tape on the route). One year, they contacted me 3 to 4 times. I can't wait for this to be done for good, so they can go back to Oklahoma!!! I have been negatively impacted trying to sell the property, and this thing hanging over our heads for nearly 10 years!!! I have suffered a hell of a lot stress not knowing what's going to happen and trying to picture what this monstrosity will look like! I'm lucky, it only hits my corner of my property. My next door neighbor will have this in his backyard!!! We are fighting this Pacific Connector on 3 fronts. We have Jordan Cove and Pacific Connector with their lies! All the government red tape and BS! And then our community that's brainwashed and worried about where the money going to go, with the backing of our so called local government!

24. Jackson County, first contacted in 2005/2006: My wife and I have had dealings with Williams/Pacific Connector since at least May 2006, starting with requests to survey our property and sign waiver of liability (why would I sign a waiver of liability for work Williams wanted to do on our property?) In early 2010, Pacific Connector asked us to sign a consent form authorizing Pacific Connector to submit an application to DSL for a Removal-Fill permit and a right-of-way inspection form. We refused this request, as did a majority of affected landowners, and Pacific Connector subsequently went around landowners by obtaining legislative approval allowing them to file the application without affected landowner approval (this was a slap in the face for landowners).

In 2013, Pacific Connector made below market option agreement offers to affected landowners which only 7% of affected landowners signed. Two subsequent additional unsolicited offers have been made for easements on our property. We have made it clear that our property rights are not for sale. Pacific Connector is only accommodating as long as they think that affected landowners are willing to sign their one-sided easement agreements.

We only want to enjoy our property in retirement without an out of state energy company trying to tell us was is good for us. What is good for us is to be left alone so we can enjoy our property free from the threat of exploitation by outside corporations.

The pipeline threat has caused us worry about the future of our property, well over 1000 hours of our time learning about and fighting the project and significant expenditure of our personal funds in support of efforts to defeat the project. We did not retire to our dream retirement location for this.

We would be devastated if this project is built. Over one-third of our 6-acre property would be clear cut, removing all vegetation including pine and oak trees, massive drilling rigs and other equipment would be brought in for the proposed 3000 foot drill under the Rogue River (from our property), and hundreds of feet of trenching dug to bury the 36 inch pipe on our property. The property would not be the same during our lifetime (pine and oak trees grow slowly and vegetation is not allowed in the permanent right-of-way). In addition, the property would not be livable during construction.

We have lived under the threat that this project will be built for over a decade, first as an import project and now as an export project. Living under the threat of eminent domain for this long violates our sense of personal security and impacts the quality of our lives. We will never understand how our government could even consider granting the power of eminent domain for a project that would allow a foreign energy company to reap huge profits by transporting mostly foreign gas to a foreign country. This is so wrong.

25. Douglas County, first contacted in 2007: Williams immediately threatened EMINENT DOMAIN which put us off from the very beginning; however, we were civil to all but Dave Randall. Much of our frustration (in addition to eminent domain) was that nobody appeared to know what they were doing. Every time they made contact, it was with a different set of maps/plans -- some so inaccurate they did not include our land even though they insisted the maps were accurate and included our property.

Along with the pipeline, they eventually planned a 5-acre staging area in the heart of our best timber growing area -- insisting the soil would not be compacted and totally unaware of a wetland. Our logger, who openly shared his lack of trust, pointed out their stupidity. They made plans with no knowledge or regard whatsoever of the existing soils, wetlands, or timber. If they did succeed, a better staging area would be on a rock outcropping which is even closer to their proposed pipeline.

Dave Randall was the worst -- a bold-faced liar who tried the "good ole' boy" approach. When his lies were brought to light, he became angry. Fortunately, we decided very early in the process not to hire an attorney or waste any money until the project was certain.

All of our logging and road maintenance plans are tentative based on the threat of the pipeline. Our financial costs were not as extensive because Williams PCP was so badly organized that we did not believe them. Due to age and health issues we have not been as involved as we would have liked.

The pipeline will impact us during construction, logging and use of our roads would be greatly restricted. The roads would be steep and, following construction, require significant maintenance. We would not have suitable access to our trees on the other side of the pipeline. Soil would be compacted and become unsuitable for planting and sustaining trees. Due to age and family structure, our ultimate plans are to someday sell the land; however, who wants to purchase land with a pipeline going through it?

It is difficult to plan and manage a business with a threat hanging over one's head. According to their latest plan, they intend to go through 1/2 mile of heavily timbered land, while including 1 1/4 miles of our roads and a 5-acre staging area. We have not received any offer of any kind of acceptable reimbursement for this offense. We do not plan to sign any easement or option agreements with Williams.

26. Coos County, first contacted in 2005/2006: We have been approached multiple times about access to property, we have not allowed any official surveying of property but the offer or two made have seemed very low considering the property loss/ damage, etc., through this 35-year-old forest land. Our area has submitted an alternative "Blue Ridge Route" that by-passes many private properties, water ways, etc. but Williams' appears to think it's easier to walk over private landowners using eminent domain to obtain the right-of-way. We are concerned about our spring water supply to the barn & our house well and access to the other side of the pipeline crossing, now & for future timber logging, will be very limited. Property value loss or even being able to sell the property would be a problem and is a concern. We have spent many hours dealing with this issue. We have had group meetings, many discussions, paper work, etc. Williams owes us a trip to Hawaii at the least thus far. Danger of a pipeline rupture or fire trapping everyone up our valley with no way out. Worry about property access/damage/loss is constant.

27. Douglas County, first contacted in 2005: All my experiences with Williams Company has been insulting, disappointing and bullying. I was first told I had to move my solar panels (my only power), so Williams could put the pipeline 100 ft. from my house. Next, Williams said they were going to cut the trees down that I'd planted as a wind break in front of my house. We have extreme -60mph- wind gusts during the winter. Then Williams was planning a permanent work zone with buildings in my front pasture next to my house and obstructing my beautiful view from the mountain top. We have a rare, endangered flower on the mountain- Crinite Mariposa Lily, which only grows in Douglas Co. Oregon. I was offered a minimal amount for an easement. This has been harassment for 11 years now from Williams. Where are our property rights? Is this the "American Way"- Eminent Domain for Corporate Gain?

The threat of the pipeline has "put on hold" any plans or decisions for 11 years. This has destroyed many lives of people in Oregon.

I have a lot of emotional stress, a lot of time involved in the fight for 11 Years, and a lot of money contributed in the fight to prevent the pipeline from ruining the land we love. I am extremely disappointed with our government, officials, representatives, and agencies who have supported the pipeline project against the will of the tax paying landowner who are the people affected by this project.

The pipeline would destroy my property by: making it unsafe to live in the house right next to the pipeline, ruin outstanding view, remove trees planted as a wind break, restrict timber transportation by limited depth of pipe installation, loss of premium flat ground next to the home site which would be used as a work zone for Williams. I will lose all confidence in our government and officials that I will ever be treated fairly. I may move to another country.

The Pacific Connector has threatened my life, my property, my trees and my love of this Country. My land is not available for the use of a money making Corporation. This is wrong, unjust and violates our Constitutional and Bill of Rights. Please don't allow the Pipeline to destroy our beautiful rivers, land and lives.

28. Douglas County, first contacted in 2006: Williams made us an offer of only $2,292 for the almost 8 acres they want to take, accompanied by an explanation of how eminent domain works. They have no idea what private property means to the families along their pipeline route. We told Williams a number of times not to come onto our property. We did not give them permission to survey our property. Yet in 2014, without our permission, and behind our backs, they came onto our property to establish a survey point that was not even near the proposed route. We only found out about it because they took the bark off a large cedar tree, on our property, to install a "bearing tree." The bearing-tree sign had their initials and date of trespass scratched into the metal sign. Soon after we put a trail-cam on the actual pipeline route to help insure our security. It was placed near our boundary with the BLM. After the BLM land was surveyed by Williams, the near-by trail-cam on our property was stolen.

This pipeline threat has cost us years of planning, letter writing and begging for our trees. The pipeline threatens a ridgetop on our property, containing our oldest, largest trees that help support the known spotted owl site on the adjacent BLM old growth forest. This part of our property has immense spiritual and recreational values to us, especially since it has large and old madrone trees. Ashes of our deceased loved-ones have even been spread in this special forest. We can't imagine a 100' wide clear-cut on that ridge.

29. Douglas County, first contacted in 2005: Original dealings with Williams were cordial, but they desired to route the pipeline directly through my home site (the original path was directly under the location that we were building our house) and that was unacceptable. Eventually the route changed a little bit and the route was no longer under the home site. Williams asked to conduct surveys on my property and I allowed them to do so under the condition that they were respectful of the land. They guaranteed me that I wouldn't even know they had been on the property. They proceeded to cut down a large number of small trees (cedar and Douglas fir) that were future timber on my property. When I asked them why they had done that, they replied that they couldn't see through the trees and they needed to cut them down to see better. From that day on, I knew I could never trust Williams to live up to the promises that they made.

I am probably one of the homeowners that Williams counts as in favor of the pipeline since I originally allowed them on my property. Nothing could be further from the truth. Even with the adjusted route, the proposed pipeline enters and exits three parcels of property that I own, coming close to my residence and threatening the water supplies for myself and seven tenant families living on property that I own. I've asked Williams what happens if the springs are impacted by the pipeline. The only response was some form of "trust us" it won't ever happen. How can I trust them when they have already broken their word to me?

Williams sent us an offer to purchase an easement across our property. It had none of the verbal promises that had been made about protecting our property. It addressed none of the concerns that we had raised in the early stages of discussion. It was for chump change. For an irrevocable easement that we will have to live with for the rest of our lives, Williams offered a few thousand dollars and then didn't even include any mitigation.

The head Williams representative for our area (I forget his name, but I still have his card) was sure to tell me all about other projects where land owners fought the pipeline company. The punchline to his stories was how it didn't matter in the end, because Williams was able to use eminent domain to get the easements they needed and the land owners got even less than Williams originally offered through the process. I took this as a not-so-veiled threat that I had better cooperate or I'd lose even more.

We delayed construction on our house for many months while we worried about the proposed pipeline. Finally, we proceeded as planned, although it has been a constant worry for many years.

We originally purchased property in Douglas County so that we could build our dream house. We purchased a large property so that we wouldn't have to worry about close neighbors doing things that would affect our tranquil setting. My wife and I intend to live the remainder of our lives on our property (hopefully 30 more years). For most of the time that we have owned our property we have had the continual threat of the pipeline hanging over us. Our children have spent the majority of their lives living under this same threat. I can't begin to tell you how great the emotional stress has been on all of us. My wife and I have had many sleepless nights. I'm now plagued by high blood pressure, even though my diet id good and I exercise regularly. We have spent many hours worrying, many hours attending meetings, many hours fighting this project.

In discussions with realtors and property shoppers, it's apparent that our property will be worth less if a pipeline is built. It turns out that most of the people that would want to buy a property like ours want peace and tranquility too. Just the possibility of the pipeline has turned off many prospective property buyers in our area.

We are very involved in the stewardship of our property. It is not only our home, but the home to many wild animals such as deer, elk, and raptors. There are ponds, streams, and wetlands.

It will crush us to see another party enter onto our land and destroy much that we cherish.

The construction of the pipeline would cause irreparable harm to our property. Areas of timber would be clear cut and never be allowed to be planted again. The area of our property the pipeline would cross is only suitable for growing timber, so if the project goes through it becomes valueless property.

The cleared pathway of the pipeline would create a super highway for trespassers. This would happen not just in one place, but in multiple places since the pipeline crosses on and off our property several times. One of the primary rights of property ownership is that it allows you to choose who can be on it. The pipeline right of way takes that away from us. We would no longer be able to keep Williams' employees off our land any time they "required" access. Whether legally allowed or a trespasser, we could never depend on the people crossing our property to take care of the property. Just last summer, Days Creek was hit with a huge forest fire that threatened many homes. Like most large fires, it was human caused. The pipeline would cause a large increase in the risk of a forest fire on our property. We the landowners would have to bear the costs of this increased risk, both through property loss and through higher firefighting costs (paid for by land owners, not easement holders).

The other main use we make of our property is raising cattle. Cattle have to be freely movable from one part of the property to another, yet at the same time, they have to be prevented from leaving the property. A pipeline across our property would make both tasks difficult since the pipeline would effectively cut our property into multiple pieces while making proper fencing difficult.

All of the water for our household and seven tenant households comes from springs on the property. The water in these springs travels a long ways, probably from the cascades. Interestingly, the water travels uphill through pressurized aquifers (you can determine this by the fact that the springs are at higher altitudes than surrounding valleys). What happens to these aquifers if the pipeline cuts through them? If the water gets diverted, even a little bit, then the springs that have been in use for decades could just dry up. This is a risk that I, as the landowner, am being asked to bear with no choice in the matter.

The proposed Pacific Connector Pipeline has plagued us for a decade just with the threat that it might be built. Williams wants to strip our property rights from us so that they can make a profit, a profit that they have no intention of sharing with those affected. We would never voluntarily do to our property what Williams wants to do, so they are trying to use eminent domain to do it anyway.

<u>30. Douglas County, first contacted in 2011</u>: We were shocked to see the initial offer from Williams was extremely low, around $5,000.00. They wanted several acres for a staging area and would take many more acres out of organic production. They have since upped their offer to around $70,000.00 but are still way too low. They presented Collier's real estate value data as authoritative, but misinterpreted or misrepresented what it meant. They offered $4,000.00

per acre. When I examined Collier's data in detail, my property was valued at $4,000.00 per acre AVERAGE. My neighbor's timberland was valued at around $800.00 per acre. When my timberland was factored in at $800.00 per acre, it pushed the value of my prime farmland to $15,000.00 per acre. I am real disappointed in how I've been treated so far by Williams Company.

We are unable to build our dream house where we wanted to as it is in the area where Williams states their pipeline must be built. Dealing with Williams has been stressful. We've lost many nights of sleep over this. I personally have taken many days off of paid work to meet, negotiate, analyze and prepare accurate and detailed responses to their offers. My feeling is that they are playing a game in that if a landowner is communicating with them they are counting that as a landowner that is in favor of the pipeline crossing their property. I feel like they have a gun called Eminent Domain pointed right at my head and that I have no choice to negotiate or I'll get whatever the court decides. Neither is a good choice. Williams to date has not presented anything close to a reasonable offer.

The pipeline would hurt our certified organic crop production. It would cause a dramatic decrease in yield until the soil health can be built back up, this is a many year process. So far Williams has refused to acknowledge this fact, which is solid science direct from the USDA. Personally, we would have construction crews, and later maintenance crews with the right to cross and work on our property in perpetuity. We feel violated, and for what? So a foreign company can profit?

The Pacific Connector Pipeline project has disrupted our lives and put many of our plans on hold. We live daily with the uncertainty that our lives are at the mercy of a foreign corporation. This proposed pipeline project simply does not meet the standard for the expropriation of private property, which is to benefit the public overall. The only benefit would be to a private foreign corporation. I'm surprised the project has come this far.

31. Douglas County, first contacted in 2007: I found the interaction with the Williams Company employees to be difficult at best. The constant implied threat of Eminent Domain gave the distinct impression that they were acting with a certain arrogance. Initially our contact with Pacific Connector was through private contractor hired by Williams Cos. These individuals were friendly and accommodating but one got the distinct feeling that the whole story was not being told to us. Later when the Williams Company employees took over direct communication with the landowners the relationship deteriorated. Eventually, under the advice of the Western Environmental Law Center in Eugene, OR I hired an environmental law firm in Portland, (Field, Jerger LLP) who has substantial prior experience in such matters, to represent us with the Williams employees and the FERC. Thereafter all contact with the Williams Cos was through my legal representative. Additionally, I was a Landowner Intervener with the FERC and filings were completed on my behalf by Scott Jerger of Field, Jerger LLP.

The threat of this pipeline has changed our plans; we purchased our 36-acre farm in 1989 with the intent of building a home and retiring there. In 2007, my late wife and I were in the midst of planning to build the home and prepare to move there permanently. As soon as the Pacific Connector Pipeline was announced and we were notified of Williams intent to bifurcate our small land parcel we stopped the planning. Nine years later and we still do not have any final resolution. In financial terms it has cost me several thousand dollars in legal fees over the years. The emotional stress, and disappointment with having to alter our long held plan to retire in Douglas County cannot be adequately measured in monetary terms.

The pipeline will render the property unusable and unsaleable. The pipe and easement would run directly down the middle of the property. This property was purchased with the intent of being a retirement home, not a working farm or ranch.

This uneconomic project to first import and then subsequently export Canadian LNG through the pristine wilderness of South Central Oregon should never have been considered in the first place. I have never been of the opinion that the State of Oregon nor our Congressional representatives at the federal level sufficiently supported the rights of the private landowners. It was truly analogous to David and Goliath. The FERC reached the correct decision. I hope and pray that the State of Oregon now begins to support the private landowners who are their constituents.

32. Jackson County, first Contacted in 2013: Williams has always been accommodating, informative and friendly. No offers. We purchased the property to get out of town, get away, camp, bbq etc., we don't want a grass freeway going through our property, removing trees from one of the prettiest portions of my property. No out of pocket costs at this time. Stress and worry and meetings with lawyers has had an emotional impact.

It would ruin the best portion of my property--the nicest part. Remove some old growth trees that are habitat for wildlife. My property is in a wildlife habitat area. So the potential for future problems with wildlife are there. The elk and deer already have enough problems to deal with, wolves now, cougars and diminishing food supplies. The pipeline would create another hardship for them. For me personally, it would be like taking my property and putting a grass freeway through it. Ruining the 10 acres I purchased for my recreation use and future home site. I saved a long time for a nice piece of property in the country.

I found a beautiful 10-acre property. I do not want a grass freeway going through it and removal of a lot of wonderful trees on the nicest part of my property. It is sickening if it were to happen. This impacts us in that P.C. will profit from land owner's property to build the pipeline to sell US natural gas to the Asian market; the land owners will receive basically nothing for their property while P.C. will make huge profits; the State or Oregon and Counties will receive millions in taxes, but land owners will receive nothing. P.C. has NO contracts with anyone to sell gas to, and the lower market value on gas make the pipeline unacceptable. Not only the fact that P.C. has no contracts, less than 5% land owner easement approval, but the pipeline would be an environmental disaster to Oregon. It will devastate some of the prettiest land in the State of Oregon.

33. Douglas County, first contacted in 2011: I first started to cooperate with Williams' process because I thought they were going to bring in gas from other countries, thinking there would be a benefit. I let them survey my land. They did make an offer for easement but I refused. I stopped cooperating with them because I found out in order to use eminent domain there must be a benefit to the public. The benefit for jobs would be temporary and I would not have any benefit.

I was going the put a new fence on my land but decided to wait until I knew what was going to happen, I am still waiting! If I were to try to sell my property with a 36 inch gas line I think it would devalue my property, meaning there are people that would not feel safe being feet away from it. Would probably have to sell at a lower price. My project to fence my land is on hold until this is settled. I've been waiting 5 years already. I am angry at them for trying to trick me. I think they planned to switch the project from the beginning.

I am firmly against eminent domain unless there is a sufficient benefit to the public.

34. Douglas County, first contacted 2005: I originally received a low offer and there has been no change in offers. I have not been treated fairly. I was lied to over and over. I was threatened over and over with eminent domain if I didn't accept their offer.

I have several projects that need doing that have been put on hold: new well, septic system, retaining wall, and planting trees.

I have suffered tremendous emotional stress, it has impacted several relationships and I have had eleven plus years of meetings that I have been forced to attend to protect my interests.

After I am dead and gone it won't be safe for sons and grandkids - 5 so far to be here. Williams has lied over and over again from the start. My best interest is not in their plan. This project is not good for our area, the environment and anyone who tries to live in this area. Eminent domain takes away my rights I fought for in Viet Nam for 2.5 years.

35. Douglas County, first contacted in 2004: I had one lowball offer from Williams which requires signing of a contract that gave Williams complete control over the easement to do whatever they wanted and left me with the liability if something went wrong. There were no good faith negotiations on their part and Williams doesn't care one whit about landowners.

I have put off installing a bridge over the creek that runs through the middle of our property because of the pipeline threat.

I have spent days reviewing documents and more days responding when I could, not to mention the time and money spent going to meetings and fighting this battle.

The thought of having that much explosive power 300 ft. from my house scares the hell out of me. I have watched the property grow over the last 25 years. I value the trees (both soft and hardwoods) of which 80% will be gone if the pipeline is approved leaving the ground bare and diminishing both the esthetic and dollar value of the property.

The stress of wondering if some impersonal foreign cooperation will be able to use eminent domain to take over part of my property is tremendous. Williams has no compassion for landowners, trees are just weeds to be removed and they don't care about what happens after they get the pipe in the ground. They will lie, cheat and connive in any way they can to get these projects approved. FERC has also been lied to and I hope they have the sense enough to see this.

36. Douglas County, first contacted in 2004/2006: Williams has completed 406 surveys through our property always with our permission. The pipeline will cause complications to the use of our property and may harm our domestic water supply.

The pipeline threat will probably add financial costs to our property maintenance due to the destruction of our hay pasture and damage our domestic water supply for our horses and other livestock. I do not believe the project is needed; China and Japan can develop their own supply – especially China!

37. Douglas County, first contacted in 2005/2006: I was not treated fairly and was disappointed with Williams. Fighting this pipeline has cost me in excess of $20,000 and countless hours traveling to and from meetings, etc., Please see letter to FERC

38. Douglas County, unsure when contacted: I have not been treated fairly by Williams. I have had a property sale for a lot of money fall through. This project has caused me a lot of worry and stress.

39. Douglas County, first contacted in 2004/2005: We have received no offers though they did come out to survey the property. I have had no conversations about the results of the survey's or the fact that there are Native American artifacts on my property. The survey plans will impact our domestic water well has caused us significant stress because it is our only source of water and impact the artifacts that are on "registered," Indian lands. My well is only 50 feet deep and if the pipeline goes in I won't have any water because my water comes from the mountain that is on the opposite side of the pipeline and would virtually cut off my water supply.

40. Jackson County, first contacted in 2011: My plans, when I bought my property, were to build a house and retire there. The prospects of living with a pipeline and the adjacent pumping plant have destroyed this dream. I can't sell my property, unless I accept a huge loss, with this abomination hanging over it, and I won't proceed with my plans to build and retire there for the same reason. So, I'm stuck in a protracted Limbo, while time ticks away, I grow older, and my retirement dream slowly fades from reality to fantasy. The emotional stress due to this ongoing hostage situation has been absolutely devastating. My physical and mental health are deteriorating as a direct result.

[The pipeline] it would destroy forever an active, healthy, and high-functioning wetland on my property that is used as a winter haven for a herd of Roosevelt Elk. If this project is implemented, that herd will never be seen nor heard again.

It has destroyed my mental and psychological well-being, and put my planning for my retirement years on seemingly permanent hold. Deny eminent domain for corporate profits!

41. Jackson County, first contacted in 2014: Williams has made some solicitations but I have had no significant conversations. The pipeline will negatively impact our business and the property's ecosystem; it has taken up some of my time. The Pacific Connector will not create any benefit to our business or property.

42. Douglas County, first contacted in 2004: Williams has been a pain in the neck! The offer they gave me was so ridiculous. Our property has forest land and if they take over an acre of my land and I can't grow trees around the pipeline it's going to take away some of my income. I'm 86 years old and worked 61 years to get this beautiful piece of property. I don't want the pipeline to blow up and ruin everything I own. I worry about the value of my property if I wanted to sell it. This project has caused me constant stress. I've lived here 42 years and want to keep this property and trees going and pretty.

43. (80+ years old), Douglas County, first contacted in 2006: Williams has NOT been accommodating. They have been annoying and disturbing my right to Peace and Quiet on my land! Plans for investing in improvements to my property were and are on hold. Also my time available for projects has been impacted! There has been emotional stress due to unwanted phone calls, improper attempts to survey property without permission. (even when I was out of state traveling with family.) Numerous trespassing incidents and invasion of privacy!! (I have more specifics, dates and information in my files.)

I am concerned about leach fields for septic system is near proposed pipeline route through my land. Also quality of well water system would be affected and the beautiful forests on my acreage would be logged for the pipeline route. The scenery would be negatively impacted--which is the main reason I chose to purchase this property.

44. Klamath County, first contacted in 2006: Offers were changed once due to their not being diligent in finding all information. I have not been contacted lately. They sent two men onto my property without my permission or knowledge. They have added more easement area to my land without telling me or including it in any offer. After realizing that I am definitely not in favor of this pipeline, some of the men with Williams have been very cool to me at meetings. The first visit I had with someone from Williams was a couple of months after the death of my husband in Spring of 2006. This has been a thorn in my side for 10 years.

I had plans to have some home sites on the hillside and have permission for one on the east end of the property, but the pipeline is going right through it, making it unusable for any purpose. The possibility of the pipeline going through my best farm land and close to the home has impacted my chances for a realistic sale price should I decide to move. I have lived on this property 50 years now and don't want to leave because of a pipeline that I fear is not safe.

The PCGP has cost me many hours and sleepless nights wondering if and when they will take over, the expense of trips to other counties for meetings about the pipeline, visits and phone calls to attorneys about the threat of eminent domain, stress over thinking about losing income from farming and decreased property value (which I will need soon to supplement my social security).

I personally do not want any utility lines or pipelines near homes due to the possibility of ruptures, holes, accidental or intentional blowouts or leaks at any time. Any incident could wipe out my farm and home. The ground squirrels are abundant in this area and could do great damage to a line. The sound of the pumping station proposed next to me is not something I want in my quiet home. I feel like I am being used for the personal gain of the owners of the pipeline who are not in the United States. Why should they be allowed to prosper at the expense of citizens of the U.S.? Some things in life should not revolve around the ones who have the most money.

45. Douglas County, first contacted in 2006: We got one inadequate offer. Information from Williams changed every time a different person contacted us. When we gave permission for surveys, we included a requirement that we be notified 48 hours in advance--which they ignored. Some surveys left flags on wires in every hay field, which were not removed as promised, so we mowed and baled--a hazard to haying equipment and to cattle eating that hay. We got the impression that each William employee was telling us whatever they felt would "shut us up".

We have deferred various improvements to our property, on the grounds that pipeline construction would destroy parts of them.

The threat of the pipeline has devalued our property--there is no way that we could currently sell it for what have invested in it. It has been the cause of many sleepless nights and much emotional disorder, significant time spent in meetings and at protests.

The pipeline trench would intercept and divert the shallow aquifer that supplies our spring, which is the only source of domestic water for another of our parcels. (Several neighbors downhill of the pipeline would similarly lose their springs.) Without water, these parcels become worthless! The settling of the trench (or berm if they overfill it) will cause major erosion to our fields during heavy rainfall.

For 10 years, we have had this "sword hanging over our head." What we constructed as our retirement dream home is turning into a nightmare.

<u>46. Klamath County, unsure of year first contacted</u>: Williams drilled a test hole years ago, didn't even leave a mark. They've always been very polite when anyone ever called. Latest I was told that they are working to go above my property, which is only 1/4 mile wide.

<u>47. Douglas County, first contacted in 2009/2010:</u> I received one offer of $2056 from Williams to construct the pipeline through the best part of our property where the road is and our "Auer" million-dollar view of the entire valley. The pipeline has involved financial costs, health issues and emotional stress and time.

We expect the value of our 58-acre ranch to be devalued approximately 35%. We have owned The ranch since 1970. My parents built Auer Jersey Farm in 1959. We live on the original hill which was a part of the original 135 acres.

Williams lied to us and told us the pipeline was only for importing gas to California; now it is planned for communist China, Japan, Korea, etc., This is not reusable [energy] why not save it [world] for our kids, grandkids, etc.,]

This pipeline is very very dangerous; 36," that's huge. The investment, wildlife, etc., eminent domain, Ha! This is not for the good of the country, just the opposite, for the few to get rich at the landowner's expense.

<u>48. Klamath County, first contacted in 2007/2008</u>: I do not want the pipeline, the offer was ridiculous. I plan on developing my property that they want to go through (132 acres). The threat of the pipeline has absolutely changed my plans. The first field they want to cross (right through the middle) I am building an Equestrian Center. I have suffered emotional stress like you cannot believe, including disagreements with my family!

This pipeline would ruin everything I am working for – I've waited and worked my whole life for this ranch and they want to literally destroy it . . . .and for pennies!! Williams has delayed all of my plans – with the unknown – and financially. They are rotten people! Tell them to stop calling me, and to stay off of my land.

<u>49. Jackson County, first contacted in 2004:</u> Over the years I have had 3 different offers. The things I have been told by Williams have changed so many times that I have stopped counting. They just say what they think you want to hear. They have come onto my property even though I have mailed papers to them stating that they are not allowed onto my property for any reason. One time they were surveying on my property not too long after I sent them one of these no trespass letters and I had to ask them to leave. Their comment was, "We had no idea that this was private property. And then they left. The financial offers that Pacific Connector have made me are an insult. But the money part for me is not the issue. The do not have enough money to get me to sign on their dotted line, because I do not want this project for any amount of money. However, this does not mean that if I am forced by the use of eminent domain that I will not seek the most amount of money I can get. But either way even if this was not wanting to cross 3 pieces of my property I do not want this project to go through because I cannot stand to see the damage that it will do to our beloved State of Oregon. It would be a tragedy of the highest magnitude. Affecting our land, water, air, wildlife, streams, plants, tourist industry, fishing, sightseeing, etc.

I don't know that I can live with a pipeline 125 feet from my home, knowing that I will be breathing the fumes that leak, and the possibility of it blowing up, would make it almost impossible to relax. The one place we are supposed to feel at ease is in our home.

I have spent the past 12 years of my life with this hanging over my head. I have gone to countless meetings, given countless speeches, done interviews with TV, radio and newspapers all in protest of this project. Costing many hundreds of days of my life, money from the thousands of flyers that I had printed and handed out to like-minded citizens and then had them mail to politicians in envelopes that I provided with addresses stamped on them. At one point over the years I was also taking care of my ailing mother until she died and became so stressed over this issue that I had to go to a psychiatrist, something I have never done before because of the stress of it all was killing me. I remember giving a speech where I had to take an anti-anxiety pill so that I could calm down enough to give it. A pill that I have never taken before. All in all, this issue has been a nightmare for me and I hope that this entire project can be shelved permanently in my lifetime.

It would cross 3 separate tax lots of my property. Nearly encircling my home. It would not only make me not feel safe, it would create a 100-foot scar over the top of the mountain in front of my home that I would have to look at forever, and then it would come, under or over the Rogue River right in front of my home. What a sight to have to look at. To take this pristine piece of land without a mar on it and destroy the beauty of it. And for what? So we can ship gas to foreign countries for the profit of a foreign gas company. This has got to be the most un-American projected ever projected.

It has taken the Joy out of my life for the past 12 years. It never leaves my mind. It would be nice if the powers that be would think of the damage to our people and environment, instead of the money. "Just because it is legal, does not mean it is morally right." Abraham Lincoln.

50. Douglas County, first contacted in 2004: I received an offer and they have changed. I am not interested in offers of any kind. Just let me live a quiet life, undisturbed. The emotional stress is always a continued threat because of the pipeline and possibly losing my well is a continual worry as is my well-being. And, knowing the pipeline is through my property affects sale value. We do not need the pipeline to disturb our private lives. This is rural. Just leave us alone.

51. Jackson County, unsure when first contacted: We have received no offers. The pipeline will divide the ranch into two separate properties.

52. Klamath County, first contacted in 2006: Our first interaction with Williams was when we found flags mysteriously placed on the timber ground several months after we had purchased it and we had no idea why they were there and who had placed them there. During early conversations with Williams, we were disbelieving that America needed this new incredibly energy intensive liquefied natural gas being proposed for import. At the advice of a friend we hired an attorney to advise and protect our property. To date, we have received one low-ball offer of $2000 for between 5-6 acres of timber ground, which was about 1/3 of what we had just purchased those acres for. The phone conversation was threatening with talk of eminent domain and that the company could put multiple pipes through once they secure easements. When the pipeline proposal resurfaced as an export project we made it emphatically clear that we did not want them on our property.

The threat of this pipeline has absolutely caused us to change our plans. Our property is 157 acres and we had intended to get home site and build a home on it. All those plans have been put on hold with the uncertainty of the pipeline, as we feel we could never recoup our investment if a high pressure 36" pipeline is allowed to run along the entire length of the access point of our property. The sheer number of years that we and others have lived with the threat and uncertainty of this pipeline is both astounding and incredibly frustrating.

We have spent untold amounts of money and time, first on the original attorney but more recently, over the past 1 1/2 years, on advertising, producing films, traveling to speak, writing endless comments at the local, state and national level, attending rallies, testifying at hearings, supporting Hike the Pipe and hiring attorneys to file legal papers--all to raise awareness and help stop a project that we feel is not only devastating to Southern Oregon and the private and public land it crosses, but also a project that exacerbates climate change, perpetuating the use of fossil fuels at a time when humanity cannot afford to do that. We have been on an intense and stressful emotional roller coaster ride for the past 18 months as well as been buoyed by meeting some incredibly wonderful people equally dedicated to protecting private property rights and the climate as we are. It has cut into all types of work and family needs we would rather be doing requiring time, money, energy and exhausting emotional capital to help debunk the idea that this project is beneficial, especially given the unstable market and current LNG oversupply. It has also been incredibly stressful from the standpoint of realizing that far too many people are seemingly willing to let a private corporation literally take someone's hard earned private property with eminent domain when it is absolutely NOT for public use, but rather for private gain. This is a very slippery slope if we allow corporations this ability...where would it stop?

The pipeline would parallel Clover Creek Road taking out 95 feet by 1/2 mile of our timber, with 50 feet of Right of Way permanently taken out of production. The pipeline would be class 1 thickness (*the thinnest allowed) through our property and heavy equipment, like our skidder, would be prohibited from crossing over it except in one pre-designated spot, limiting our ability to manage our timber. The introduction of the risk of catastrophic fire is worrisome in our increasingly dry and pro-longed summers. Williams Company has a lengthy list of serious accidents that have caused extensive damage to property and loss of life. One reason we bought our property was to build on it as it is located in a utility free corridor sandwiched between old growth forest and 1 mile as the crow flies from Mountain Lakes Wilderness. The Pipeline would cut through the old growth and leave a clear cut more than 16 miles along Clover Creek Road requiring a complete change in Freemont-Winema National Forest record of decision for the public lands and wiping out the "protected view shed" of the wilderness area.

The Pacific Connector Pipeline has been emotionally draining and held landowners' hostage and in limbo for 10 years. It has made us question the motivations of our leaders in Oregon and pit us against powerful unions who seem to feel that landowners should sacrifice the blood, sweat and tears they have poured into their properties for some "temporary" jobs and the very real and permanent destruction this project will cause to private property rights, land, water and atmosphere. I've learned that the current economics of energy intensive LNG do not warrant the risk to fisheries, agriculture, timber and tourism--all industries that are threatened by perpetuating the use of fossil fuels and worth $48 billion annually in Oregon. Coming head to head with this industry has forced me to learn more and I understand even more now how these companies operate. It is very much for their bottom line and benefit, not for ours. Oregon beware!

53. Coos County, first contacted in 2004: I have gotten 4 different offers in the past 12 years, none of which reflect the impact it would have on my property or me personally! At first they were very professional, but in the last 12 months not so much. They have attempted to come on my property without my permission and have entered my property while I was gone!

I have wanted to build new out buildings and fence but due to the pipeline placement they would be torn down. So right now I feel I cannot make these improvements!

The phone calls are constant and at one time in particular, threatening. Steve Lyons, (a "rep") said, "If you don't take the money soon it could get nasty." This was very upsetting and now when they call I don't sleep well and become emotionally stressed!

Because the pipeline will be crossing my field diagonally it will not allow me to have the cows or produce the hay needed for them. I can't rent my small house (2nd house on property). When people find out about the possible pipeline they move on. Also they have told me I would have a turn off station on my property, another visual and possible hazard. All of this affects my income now and the value later.

My currently peaceful and tranquil life in the country would be greatly affected financially, emotionally, visually; especially my safety, the pipeline proposed would run less than 100 feet from the front doors on both houses and has made my rental unrentable! It would take almost 5 years for my field, if not longer, to recover from this construction.

54. Douglas County, first contacted in 2005/2006: We have not talked to, nor have we wanted to talk to anyone from Williams Co. We did receive a written offer which was very low. We did not respond to the offer.

We grow timber trees. We depend on the timber for our retirement. Our daughter talked of moving here to help us as we age, but she doesn't want to live near the pipeline. My husband, Ron, is a disabled vet and it would be very difficult to relocate him. We are afraid. We are in our 70's. We planned to have this place as our retirement, but if the pipeline goes through we would lose a great deal of the value of our land.

The pipeline will run through the area in which we grow our cedar trees and we would no longer have use of that ground. It would run along the property line within a few hundred feet of our rental. People are afraid to live there. We have been in limbo for more than 10 years. These 80 acres have been in the Munch family since 1946. It is mostly timber. The timber harvest is part of our livelihood. The loss of several acres of our land is detrimental to our well-being. Taking land from an American citizen by eminent domain and giving it to a company working with a foreign corporation is criminal. It should NEVER happen in this country.

JACKSON COUNTY
Oregon

Board of Commissioners

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March 17, 2016

Chairman Norman C. Bay
Commissioner Cheryl A. LaFleur
Commissioner Tony Clark
Commissioner Colette D. Honorable
Ann F. Miles, Director
Office of Energy Projects
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

Re: Jordan Cove Energy Project, LP — Docket No. CP13-483-001
Pacific Connector Gas Pipeline, LP — Docket No. CP13-492-001

Dear Chairman Bay, Commissioners LaFleur, Clark, and Honorable, and Director Miles:

The Jackson County Board of Commissioners respectfully requests that the Federal Energy Regulatory Commission (FERC) uphold its previous order in the above referenced proceedings and deny the applications. Jackson County opposed the above applications and believes upholding the denial is in the public's interest for the following reasons.

First, Jackson County opposes the use of eminent domain for private economic benefit. To the best of our understanding, a significant portion of the property required for the Pacific Connector Gas Pipeline project (Pacific Connector) would be required to be obtained through the use of eminent domain and not through willing transactions with the affected property owners in our County. Our stance opposing eminent domain for private economic benefit is so strong that we have adopted an Ordinance, codified as Section 216.23 of the Codified Ordinances of Jackson County, specifically opposing it as a practice. Further, in passing Measure 39 in 2006, the people of the entire State of Oregon also made it clear that the entire state was opposed to using eminent domain for private economic benefit. While not binding on the applicant in this situation, the people who would be impacted by such actions and the people of the entire State of Oregon have clearly stated that they are opposed.

Second, the process for the Pacific Connector has been ongoing for over a decade. Property owners along the route of the project have had their property under threat of a taking for this entire time. This has dramatically impacted their ability to develop, sell or otherwise make any decisions on their property because of the potential for an eminent domain action, all along, without any compensation for this continued cloud over their rights as a property owner.

Third, the March 11, 2016 order of the Commission denying the applications clearly establishes that the Commission found that there was no demonstrated benefit to the public interest that outweighed the adverse impacts to the property owners. The property owners in Jackson County have suffered enough with the threat of this project and its impacts on their property. The Commission, itself, agreed when it denied the applications.

As such, we again, respectfully request that the Commission uphold its previous Order denying the above referenced applications. It is time that the property owners be allowed to come out from underneath the cloud this project has placed on their property.

Sincerely,

JACKSON COUNTY BOARD OF COMMISSIONERS

Rick Dyer

Rick Dyer, Chair

Colleen Roberts

Colleen Roberts, Commissioner

Doug Breidenthal, Commissioner

JB:ld

cc: Governor Kate Brown
U. S. Senator Ron Wyden
U. S. Senator Jeff Merkley
U.S. Representative Greg Walden
U.S. Representative Peter DeFazio

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Independent Statistics & Analysis
U.S. Energy Information Administration

Effect of Increased Levels of Liquefied Natural Gas Exports on U.S. Energy Markets

October 2014

Independent Statistics & Analysis
www.eia.gov

U.S. Department of Energy
Washington, DC 20585

This report was prepared by the U.S. Energy Information Administration (EIA), the statistical and analytical agency within the U.S. Department of Energy. By law, EIA's data, analyses, and forecasts are independent of approval by any other officer or employee of the United States Government. The views in this report therefore should not be construed as representing those of the Department of Energy or other Federal agencies.

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Introduction

This report responds to a May 29, 2014 request from the U.S. Department of Energy's Office of Fossil Energy (DOE/FE) for an update of the Energy Information Administration's (EIA) January 2012 study of liquefied natural gas (LNG) export scenarios. This updated study, like the prior one, is intended to serve as an input to be considered in the evaluation of applications to export LNG from the United States under Section 3 of the Natural Gas Act, which requires DOE to grant a permit to export domestically produced natural gas unless it finds that such action is not consistent with the public interest. Appendix A provides a copy of the DOE/FE request letter.

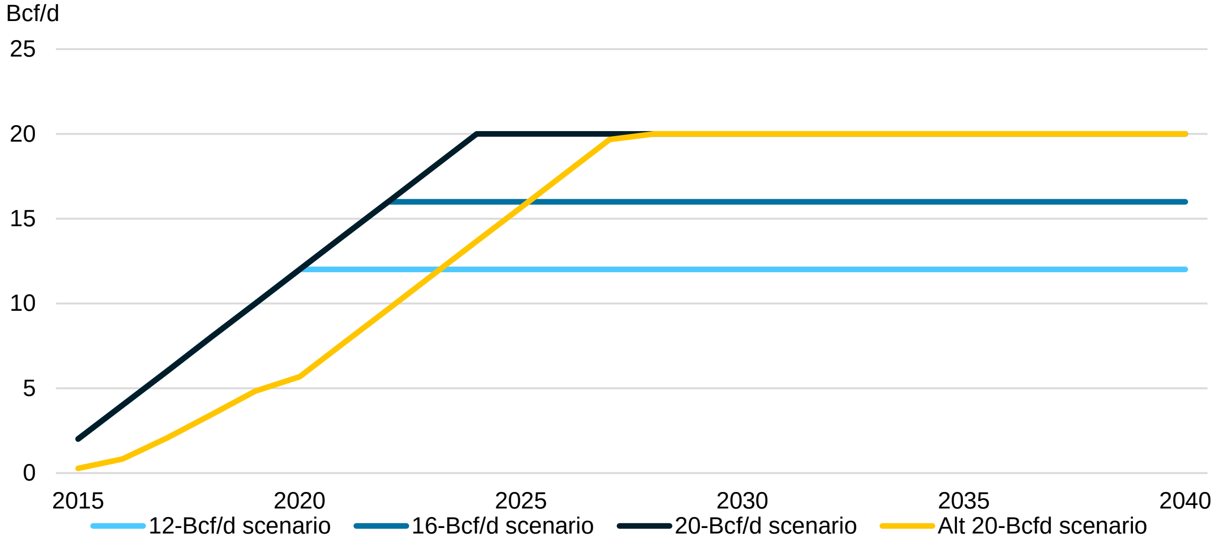
DOE/FE asked EIA to assess how specified scenarios of increased exports of LNG from the Lower 48 states could affect domestic energy markets, focusing on consumption, production, and prices. The DOE/FE scenarios posit total LNG exports sourced from the Lower 48 states of 12 billion standard cubic feet per day (Bcf/d), 16 Bcf/d, and 20 Bcf/d, with these exports phased in at a rate of 2 Bcf/d each year beginning in 2015.

DOE/FE requested that EIA consider the specified Lower 48 states LNG export scenarios in the context of baseline cases from EIA's 2014 Annual Energy Outlook (AEO2014) that reflect varying perspectives on the domestic natural gas supply situation, the growth rate of the U.S. economy, and natural gas use for electricity generation. The AEO2014 cases considered in this report include:

- The AEO2014 Reference case
- The High Oil and Gas Resource (HOGR) case, which reflects more optimistic assumptions about domestic natural gas supply prospects than the Reference case
- The Low Oil and Gas Resource (LOGR) case, which reflects less optimistic assumptions about domestic oil and natural gas supply prospects than the Reference case
- The High Economic Growth (HEG) case, in which the U.S. gross domestic product grows at an average annual rate 0.4 percentage points higher than in the Reference case, resulting in higher domestic energy demand
- The Accelerated Coal and Nuclear Retirements (ACNR) case, in which higher costs for running existing coal and nuclear plants result in accelerated capacity retirements, resulting in more reliance on natural gas to fuel electricity generation than in the Reference case

EIA recognizes that the ramp-up specified by DOE/FE for the scenarios analyzed in this report, under which total Lower 48 states LNG exports reach 12 Bcf/d in 2020, is extremely aggressive, indeed almost impossible, and that the ultimate LNG export levels specified by DOE/FE are also very unlikely for some of the baselines. EIA understood that the DOE/FE scenarios were intended to provide results that show an outer envelope of domestic production and consumption responses that might follow from the approval of export licenses beyond 12 Bcf/d. Accordingly, EIA also included a 20 Bcf/d export scenario, applied to the Reference case, with a delayed ramp-up to identify the impact of higher LNG exports implemented at a more credible pace. The DOE/FE scenarios, as well as the alternative 20 Bcf/d (Alt 20-Bcfd) scenario are shown in Figure 1.

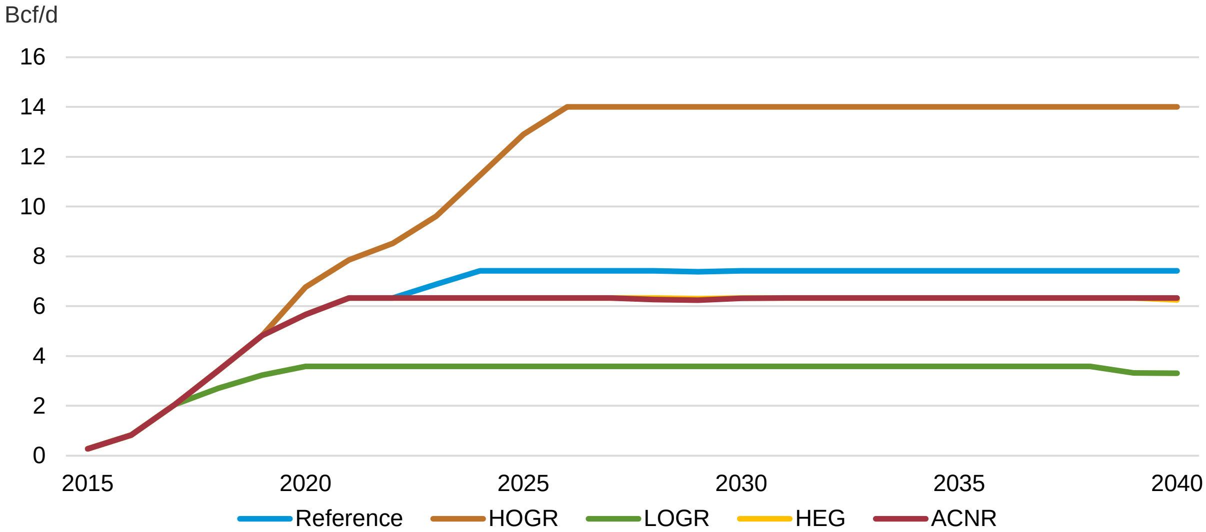
Figure 1. Lower 48 states LNG exports in scenarios specified by DOE/FE



Each of the five AEO2014 cases used as baselines in this study already includes some amount of LNG exports from the Lower 48 states. The LNG exports in the AEO2014 baseline cases, rather than the scenarios specified for this study, reflect EIA's own views on future LNG exports. As shown in Figure 2, LNG exports from the Lower 48 states in the baselines have projected 2040 levels ranging from 3.3 Bcf/d (LOGR case) to 14.0 Bcf/d (HOGR case). Projected exports are positively correlated with the abundance of the domestic resource base, and negatively correlated with the level of domestic natural gas demand.[1]

[1] In the HOGR baseline case, projected Lower 48 states LNG exports exceed 12 Bcf/d, one of the specified DOE/FE scenarios, by the mid-2020s. Although the 12-Bcf/d scenario with the HOGR case assumptions is included in the figures and tables of this report, it is excluded from the narrative of the discussion of the ranges of results due to LNG exports being less than the baseline.

Figure 2. Lower 48 states LNG exports in the five AEO2014 baseline cases

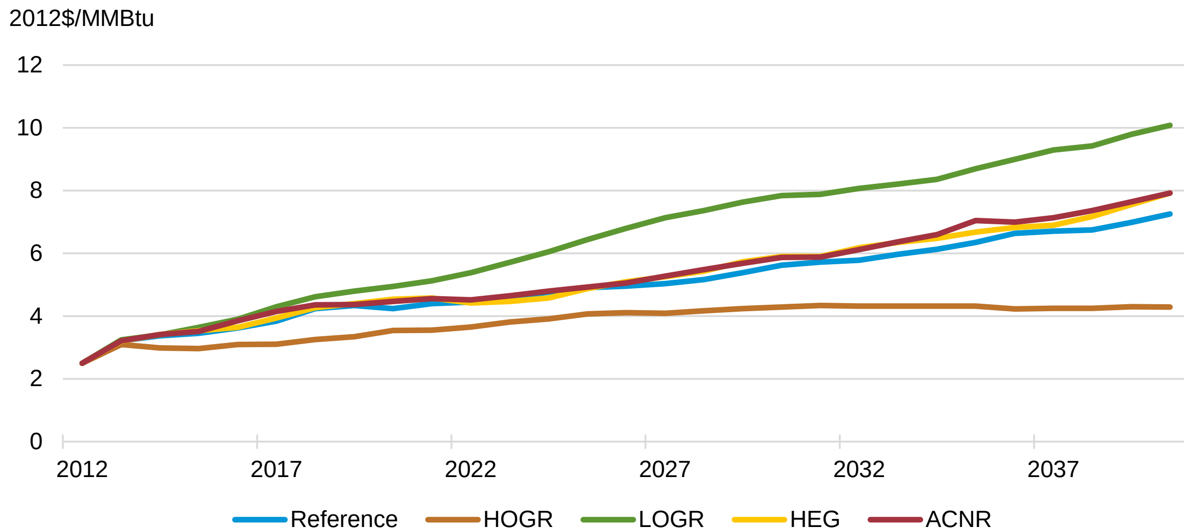


Note: The HEG and ACNR baselines have very similar LNG export paths that are indistinguishable in this figure.

As shown in Figure 3, projected U.S. natural gas prices increase in each of the five baseline cases. The price paths depend on the assumptions made regarding the resource base and advances in production technology, economic growth, and natural gas demand. In the Reference case, the average Lower 48 state supply price more than doubles between 2013 and 2040, ultimately reaching $7.25/Million British thermal units (MMBtu) in 2040.[2] In contrast, under the more optimistic resource assumptions of the HOGR case, prices increase by only 38% by 2040 and never rise above $4.34/MMBtu. Under the more pessimistic resource assumptions of the LOGR case, prices reach $10.08/MMBtu in 2040.

[2] All prices in this report are in 2012 dollars unless otherwise noted. To convert one thousand cubic feet (Mcf) to MMBtu, a ratio of 1 Mcf to 1.027 MMBtu was used.

Figure 3. Average Lower 48 states natural gas supply price in the five AEO2014 baseline cases used in this study



The different price paths in Figure 3 are key drivers of variation in the level of Lower 48 states LNG exports across the AEO2014 baseline cases. The amount of added Lower 48 LNG exports above the baseline projection required to fulfill each of the export scenarios specified by DOE/FE for this analysis, cumulative Lower 48 LNG exports at specified dates for each baseline, and additional Lower 48 states cumulative exports above baseline through those same specified dates for each of the DOE/FE scenarios are reported in Table 1. For example in the Reference case baseline, Lower 48 states exports are 5.7 Bcf/d in 2020 and cumulative exports through 2020 are 6.2 trillion cubic feet (Tcf). In the 12-, 16- and 20-Bcf/d export scenarios, cumulative exports through 2020 are 9.1 Tcf above those in the Reference case baseline (as shown in the lower panel of Table 1).

Estimated price and market responses to each pairing of a specified export scenario and a baseline will reflect the additional amount of LNG exports needed to reach the targeted export level starting from that baseline. For example, as shown in Table 1, the 20-Bcf/d export scenario starting from the HOGR baseline requires a smaller additional amount of cumulative exports relative to baseline (55.4 Tcf over the 2015-40 period) than the 12-Bcf/d export scenario starting from the LOGR baseline (72.3 Tcf over the same period).

Table 1. Added LNG exports needed in each pairing of DOE/FE export scenarios and baseline cases

	Reference						HOGR						LOGR					
	2015	2020	2025	2030	2035	2040	2015	2020	2025	2030	2035	2040	2015	2020	2025	2030	2035	2040
Export level (Bcf/d)	0.3	5.7	7.4	7.4	7.4	7.4	0.3	6.8	12.9	14.0	14.0	14.0	0.3	3.6	3.6	3.6	3.6	3.3
Cumulative exports since 2015 (Tcf)		6.2	18.8	32.3	45.9	59.4		6.6	24.9	50.5	76.0	101.6		4.6	11.2	17.7	24.3	30.6
Difference from baseline in cumulative LNG exports for each DOE/FE export scenario /baseline pairing (Tcf)																		
12-Bcf/d		9.1	18.5	26.8	35.2	43.5		8.7	12.3	8.6	5.0	1.3		10.7	26.1	41.4	56.8	72.3
16-Bcf/d		9.1	25.0	40.7	56.3	72.0		8.7	18.9	22.5	26.2	29.8		10.7	32.6	55.3	77.9	100.8
20-Bcf/d		9.1	28.7	51.6	74.6	97.5		8.7	22.5	33.5	44.4	55.4		10.7	36.3	66.2	96.2	126.3
Alt 20-Bcf/d*		0.0	8.8	30.7	53.7	76.6												

*Note: EIA included the Alt 20 Bcf/d scenario to reflect a more realistic ramp-up of near-term LNG exports

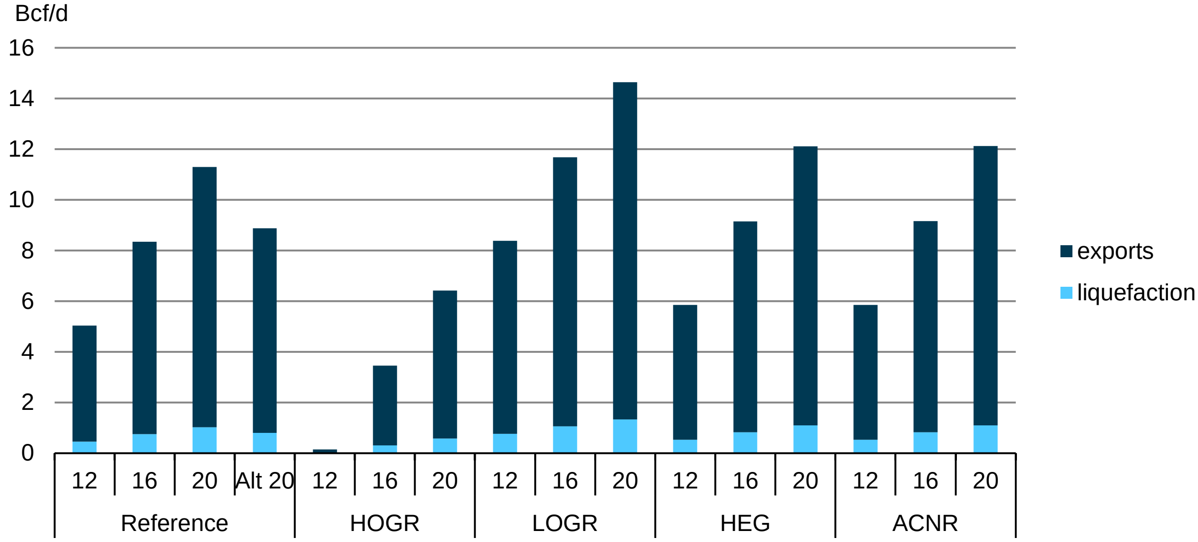
Although the study reports results for all pairings of export scenarios and baselines, some combinations are inherently less plausible than others. High additional levels of LNG exports are unlikely to occur under baseline conditions associated with high U.S. natural gas prices because high domestic prices and limited resources to grow supply would discourage investment in projects to liquefy and export domestic gas. The combination of the 20-Bcf/d export scenario with LOGR case baseline, which projects U.S. producer-level prices near $8/MMBtu by 2030 and above $10/MMBtu by 2040 even before consideration of added LNG exports, seems particularly implausible.

Analysis approach

EIA used the five AEO2014 cases described above as the starting point for its analysis and made several changes to represent the export scenarios specified in the study request. EIA exogenously added LNG exports from the Lower 48 states in its model runs, using the National Energy Modeling System (NEMS), to reach the targeted LNG export levels. The Mid-Atlantic and South Atlantic regions were each assumed to host 1 Bcf/d of LNG export capacity, the Pacific region was assumed to host 2 Bcf/d, with all of the remaining Lower 48 states' export capacity hosted along the Gulf Coast in the West South Central Census division.

In addition to the volume of natural gas needed to satisfy the levels of LNG exports defined in the scenarios, a supplemental volume of gas is required in order to liquefy natural gas for export as LNG. EIA assumed that this volume would equal 10% of the LNG export volume (Figure 4). The additional natural gas consumed during the liquefaction process is counted as fuel use within the U.S. region where liquefaction occurs.

Figure 4. Added average LNG export-related demand needed in each pairing of DOE/FE export scenarios and baseline cases (2015-40)



As in AEO2014, U.S. natural gas pipeline imports and exports and U.S. LNG imports are endogenously determined in the model. However, LNG exports out of Alaska were set exogenously to the projected level from the corresponding baseline cases.

One further modeling change was applied only in export scenario runs using the ACNR case. The ACNR case was included in the study to reflect a baseline with high use of natural gas and low use of coal for electricity generation that is driven by factors other than favorable natural gas supply conditions and low natural gas prices, which are considered in the HOGR case. In order to represent a situation in which increased coal generation is not an available response to higher domestic natural gas prices, coal-fired generation was not allowed to rise above the ACNR baseline level when the DOE/FE export scenarios were implemented. In effect, the model was forced to accommodate added LNG exports using a combination of responses other than a reversion to coal-fired generation.

Caveats regarding interpretation of the analysis results

EIA recognizes that projections of energy markets over a 25-year period are highly uncertain and subject to many events that cannot be foreseen, such as supply disruptions, policy changes, and technological breakthroughs. This uncertainty is particularly true in projecting the effects of exporting significant LNG volumes from the United States because of the following factors:

- NEMS is not a world energy model and does not address the interaction between the potential for additional U.S. natural gas exports and developments in world natural gas markets.
- Global natural gas markets are not fully integrated, and their nature could change substantially in response to significant changes in natural gas trading patterns. Future opportunities to profitably export natural gas from the United States depend on the future of global natural gas markets, the inclusion of relevant terms in specific contracts to export natural gas, as well as on the assumptions in the various cases analyzed.

- Given its focus on the domestic energy system, NEMS does not fully account for interactions between energy prices and the global economy that could benefit the U.S. economy. For example, while NEMS reflects both the positive effects of higher domestic production and the negative effects of higher domestic energy prices on the U.S. economy, it does not include a linkage between energy prices outside the United States and global economic performance. As in the United States, a reduction in the price of imported energy tends to support economic activity. Any reduction in global natural gas prices that might occur as a result of U.S. LNG exports would tend to stimulate the economies of countries that import gas, increasing their demand for both domestic goods and services and imports sourced from the United States and elsewhere. Because the NEMS model does not consider how LNG export might change natural gas pricing in overseas markets, or the implications of such changes for economic activity, this interaction is not reflected in this study. Capturing that linkage would require the use of a global economic model that explicitly includes the energy sector.
- Measures of domestic industrial activity in NEMS are sensitive to both the composition of final U.S. demand and changes in domestic energy prices. However, NEMS does not account for the impact of domestic and global energy price changes on the global utilization pattern for existing manufacturing capacity or the siting of new capacity inside or outside of the United States in energy-intensive industries. Assessment of these effects can be challenging and require careful attention to detail. For example, while the implementation of the export scenarios raises domestic natural gas prices relative to the baseline, increases in production from shale gas resources that provide most of the natural gas used to increase LNG exports also increase the projected domestic supply of natural gas liquids such as ethane and propane that are important feedstock for some energy-intensive industries.

EIA's January 2012 analysis of LNG exports, Effect of Increased Natural Gas Exports on Domestic Energy Markets, includes an extensive discussion of caveats and issues involving the representation of global natural gas markets and their interaction with the North American market. Much of that discussion also applies to the analysis contained in this updated report. Additional observations regarding issues surrounding the estimation of economic impacts of the export scenarios are provided in the economic results section of this report.

Summary of Results

- **Increased LNG exports lead to increased natural gas prices.** Starting from the AEO2014 Reference case baseline, projected average natural gas prices in the Lower 48 states received by producers in the export scenarios are 4% (12-Bcf/d scenario) to 11% (20-Bcf/d scenario) more than their base projection over the 2015-40 period. Percentage changes in delivered natural gas prices, which include charges for gas transportation and distribution, are lower than percentage changes in producer prices, particularly for residential and commercial customers. Starting from the AEO2014 Reference case baseline, projected average Lower 48 states residential natural gas prices in the export scenarios are 2% (12-Bcf/d scenario) to 5% (20-Bcf/d scenario) above their base projection over the 2015-40 period.
- **Natural gas markets in the United States balance in response to increased LNG exports mainly through increased natural gas production.** Across the different export scenarios and baselines, higher natural gas production satisfies about 61% to 84% of the increase in natural gas demand from LNG exports, with a minor additional contribution from increased imports from Canada. Across most cases, about three-quarters of this increased production is from shale sources.
- **Supply from higher domestic production is augmented by reductions in natural gas use by domestic end-users, who respond to higher domestic natural gas prices.** As a result of higher natural gas prices, the electric generation mix shifts towards other generation sources, including coal and renewables, with some decrease in total generation as electricity prices rise. The reduction in the average annual level of gas-fired generation over the 2015-40 period ranges from 30 to 146 billion kilowatthours (kWh), starting from levels that range from 1200 to 1782 billion kWh across the five baselines used in this study. There is also a small reduction in natural gas use in all sectors from efficiency improvements and conservation.
- **Increased LNG exports result in higher total primary energy use and energy-related CO_2 emissions in the United States**. The 0.1% to 0.6% increase in total primary energy use and a -0.1% to 0.6% change in CO_2 emissions relative to baseline over the 2015-40 period reflect both increased use of natural gas to fuel added liquefaction and fuel switching in the electric power sector that for some cases increases both fuel use and emissions intensity.
- **Consumer expenditures for natural gas and electricity increase modestly with added LNG exports**. On average, from 2015 to 2040, natural gas bills paid by end-use consumers in the residential, commercial, and industrial sectors combined increase 1% to 8% over a comparable baseline case, depending on the export scenario and case, while increases in electricity bills paid by end-use customers range from 0% to 3%. These estimates reflect the combined impact of higher prices and small reductions in natural gas and electricity use.
- **Added U.S. LNG exports result in higher levels of economic output, as measured by real gross domestic product as (GDP)**. Increased energy production spurs investment, which more than offsets the adverse impact of somewhat higher energy prices when the export scenarios are applied. Economic gains, measured as changes in the level of GDP relative to baseline, range from 0.05% to 0.17% and generally increase with the amount of added LNG exports required to fulfill an export scenario for the applicable baseline. As noted in the previous discussion of caveats, EIA's NEMS model is focused on the U.S. energy system and the domestic economy and does not address several key international linkages that may increase economic benefits.

- **Added U.S. LNG exports result in higher levels of domestic consumption expenditures for goods and services in most cases**. Domestic consumption is influenced more by movements in energy prices, than increased energy production. In most cases, U.S. consumers increase their consumption expenditures as the positive impacts of increased energy production outweigh energy price changes. As energy prices increase by more than 10% above baseline, then consumption changes become very small to negative in some instances. Consumption gains range from 0.0% to 0.08% and generally increase with the amount of added LNG exports required to fulfill an export scenario for the applicable baseline.
- **Results for export scenarios using baselines representing higher domestic demand for natural gas than in the Reference case both economy-wide (HEG case) and specifically for electric power generation (ACNR case) differ only slightly from those using the Reference case baseline.** Although domestic gas use is higher in the HEG and ACNR baselines than in the Reference baseline, the preponderance of the energy market response to added LNG exports occurs on the supply side, with similar price, expenditure, and economic effects across the three baselines.
- **Results for export scenarios using the HOGR and LOGR baselines that respectively make more optimistic and more pessimistic assumptions regarding natural gas resources and technology than the Reference case show some differences from those using the other baselines.** The amount of added LNG exports to fulfill the export scenarios is smaller for the HOGR baseline, which starts with relatively high LNG exports, than for other baselines. At the same time, the greater ability to increase production also holds down increases in natural gas prices. The LOGR case is the opposite, requiring the largest amount of added LNG exports to fulfill the export scenarios under supply conditions that make it more difficult and costly to raise production, leading to modeled outcomes with the highest impacts on natural gas prices and the largest diversions of natural gas from domestic end uses. As noted in the introduction, competition in global LNG markets is likely to prevent the realization of high LNG exports under the unfavorable domestic supply conditions of the LOGR case.
- **A slower, more realistic, ramp-up in LNG export capability results in slightly lower price impacts in the early years of the projection and delays increases in domestic natural gas production that support higher LNG exports.** In the scenarios specified by DOE/FE, LNG exports from the Lower 48 states start in 2015 and rise rapidly to reach 12 Bcf/d by 2020. EIA implemented the Alt 20-Bcf/d scenario, under Reference case conditions. In EIA’s Alt 20-Bcf/d scenario, the ramp-up in Lower 48 states LNG exports is delayed but still quite aggressive, reaching 12 Bcf/d in 2023. Comparison of results for the “alt” and “standard” versions of the 20-Bcf/d scenario shows very modest differences in impacts over the entire projection period.
- **AEO2014, which includes the cases used as baselines in this study, best reflects EIA’s view on LNG exports and U.S. natural gas markets more generally**. Consideration of the energy market and economic implications of export scenarios specified by DOE/FE in this analysis should not be construed as reflecting any change in EIA’s own projections.

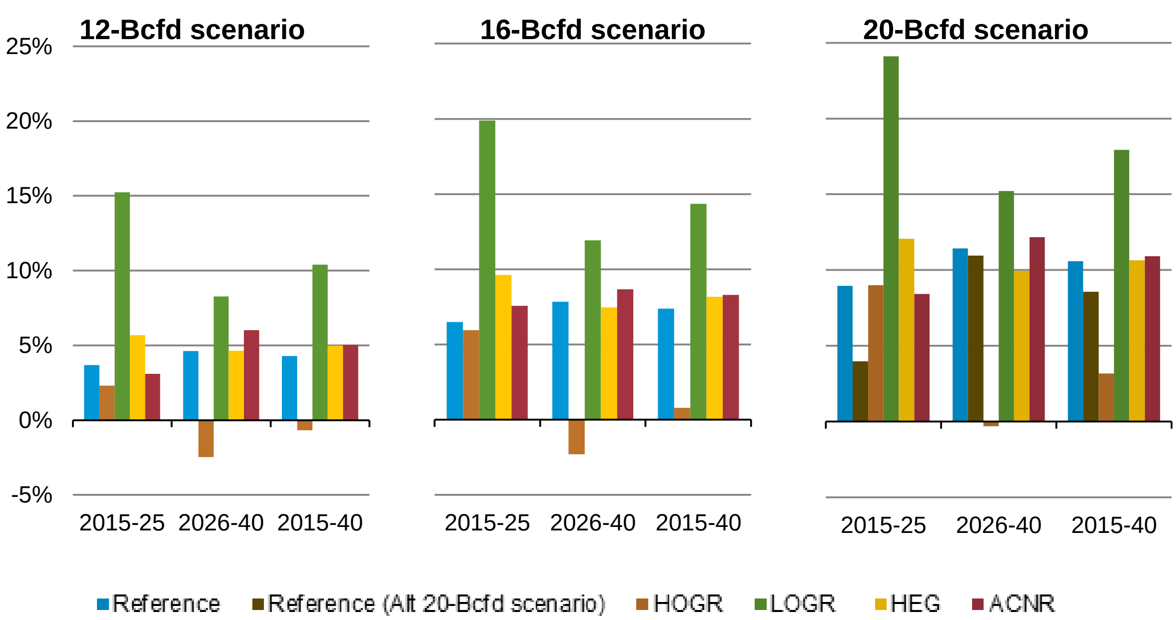
Energy Market Results

This section summarizes the analysis results for energy prices, demand, supply, the electricity mix, primary energy use, energy-related CO_2 emissions, and energy expenditures. Model results for each scenario/baseline combination are compared to baseline-only results to identify the impacts of the export scenarios.

Natural gas prices

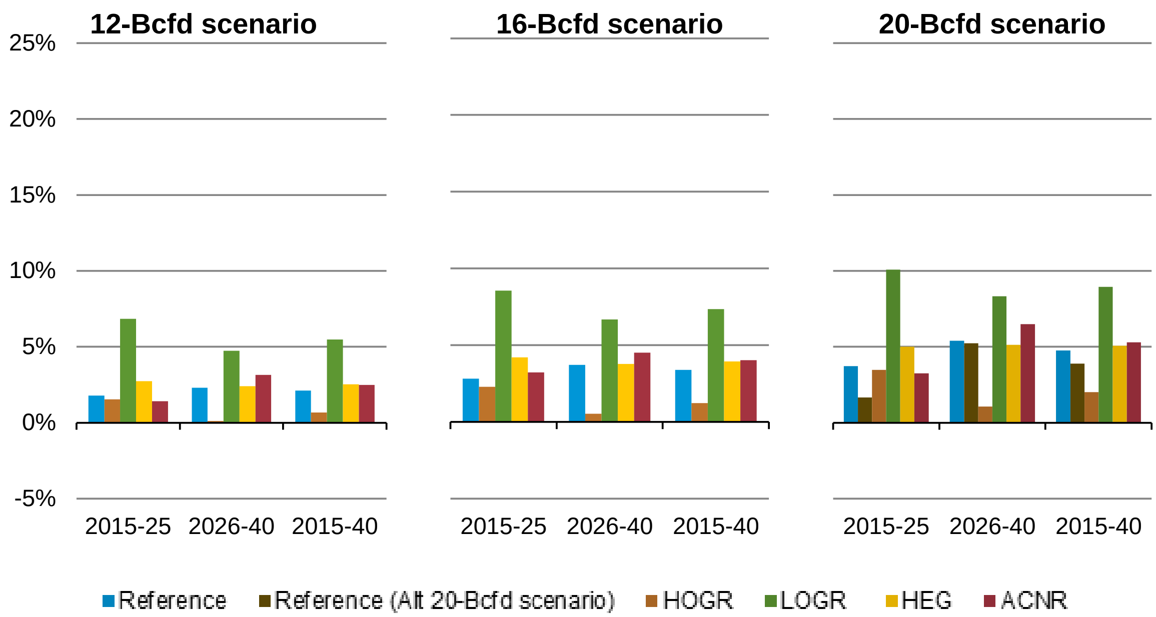
Generally, natural gas prices increase relative to their respective base cases, with the greatest impact during the 2015-25 timeframe when LNG exports are ramping up (Figure 5). The least and greatest price changes occur when the export scenarios are considered using the HOGR and LOGR baselines, respectively, since, as shown in Table 1, implementing the export scenarios from these baselines requires the least and greatest change in export levels. Starting from the HOGR baseline, average Lower 48 states natural gas prices at the producer level decrease 1% in the 12-Bcf/d scenario for the 2015-40 period, reflecting a decline in LNG export volumes relative to baseline after 2024. Average Lower 48 states supply price increases range from 1% (16-Bcf/d scenario) to 3% (20-Bcf/d scenario) in the HOGR baseline. When the export scenarios are implemented in the context of the LOGR baseline, the impact of average Lower 48 states natural gas prices at the producer level ranges from 10% (12-Bcf/d scenario) to 18% (20-Bcf/d scenario) over the 2015-40 period.

Figure 5. Percentage change in average Lower-48 states natural gas supply prices relative to baseline



Although the increases in natural gas prices at the producer level translate to similar absolute increases in delivered prices to customers, the percentage change in prices that industrial and electric customers pay tends to be somewhat lower than the change in the producer price. And the percentage change in prices that residential and commercial customers pay is significantly lower. These lower values are because delivered prices include transportation charges (for most customers) and distribution charges (especially for residential and commercial customers) that do not vary significantly across export scenarios. For example, while the natural gas supply price increases across the three export scenarios range from 4% to 11% in the Reference case, the corresponding percentage increases in residential prices range from 2% to 5% (Figure 6).

Figure 6. Percentage change in average natural gas residential prices relative to baseline



Summary statistics on delivered prices are provided in Appendix B. More detailed results on delivered prices and other report results can be found in the standard National Energy Modeling System (NEMS) output tables posted online.

Natural gas supply and consumption

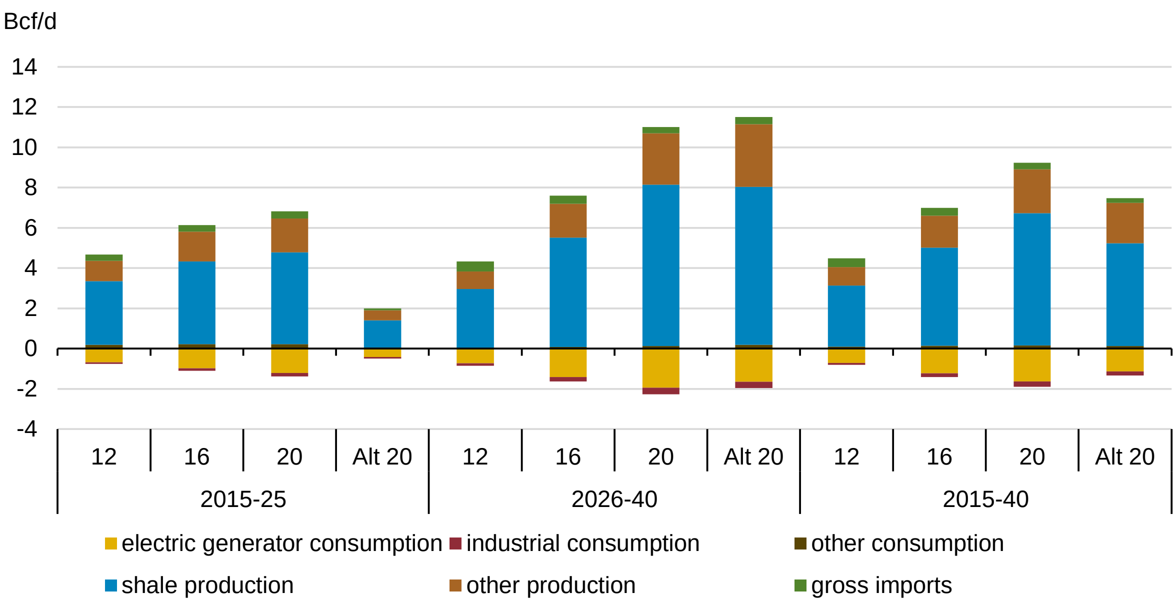
In the AEO2014 Reference case, total domestic natural gas production grows from 67.5 Bcf/d in 2015 to 102.6 Bcf/d in 2040, averaging 89.0 Bcf/d over the 2015-40 period. The United States becomes a net exporter of natural gas before 2020, due to declining net imports from Canada and increasing net exports of natural gas to Mexico via pipeline and to overseas markets as LNG.

U.S. natural gas consumption is projected to grow in all sectors other than the residential sector, where increased efficiencies and migration to warmer regions drive consumption down. Average annual natural gas consumption between 2015 and 2040 in the electric power sector is 26.7 Bcf/d, accounting for 38% of delivered natural gas end-use volumes. The industrial sector consumes an average of 22.9 Bcf/d over the same period, 33% of total delivered natural gas consumption. Average natural gas volumes projected to be consumed by the residential and commercial sectors between 2015 and 2040 are 11.9 Bcf/d and 9.0 Bcf/d, respectively. Consumption in the electric power sector, the largest consumer of natural gas during the projection period, is particularly responsive to the level of natural gas prices.

As discussed above, implementing the scenarios specified for this analysis results in added LNG exports and higher domestic natural gas prices. Higher prices lead to increases in domestic natural gas production and pipeline imports from Canada, and decreases in domestic natural gas consumption. In all pairings of the export scenarios and baselines, most of the additional natural gas needed for export is provided by increased domestic production, with a minor contribution from increased natural gas imports, largely from Canada.

For example, using the Reference case baseline, added LNG exports average 10.3 Bcf/d from 2015-40 in the 20-Bcf/d scenario. Total natural gas supply is up by 9.1 Bcf/d, and delivered domestic volumes of natural gas are down by 2.3 Bcf/d (Figure 7). Increased natural gas production from shale gas resources provides about 72% of the 9.1 Bcf/d supply increase, with other natural gas production providing roughly 24% and pipeline imports from Canada accounting for the remainder. About 71% of the 2.3 Bcf/d decrease to end-use consumption occurs in the electric power sector and 11% in the industrial sector, on average, from 2015-40. The projected consumption decrements are relatively small in the context of baseline levels and trends. For example, average natural gas use for electricity generation is 25.0 Bcf/d over 2015-40 in the 20-Bcf/d scenario, only 1.6 Bcf/d below the Reference case baseline level. For the industrial sector, average natural gas consumption of 22.7 Bcf/d over the 2015-40 period in the 20-Bcf/d scenario is just 0.3 Bcf/d below the Reference case baseline level.

Figure 7. Change in average natural gas supply and delivered end-use consumption in three export scenarios relative to the Reference case baseline (excludes natural gas liquefaction consumption)

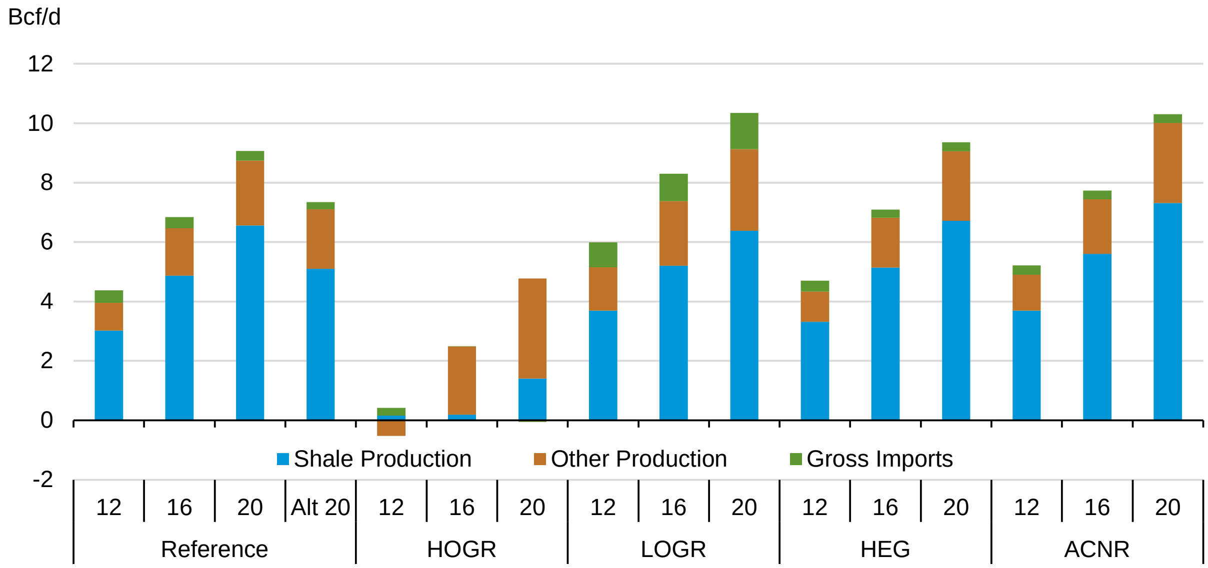


Natural gas supply response

Increased domestic production provides most of the additional natural gas needed to support added LNG exports across the cases and scenarios, as shown in Figure 8. In all cases, with the exception of the HOGR case, production from shale resources accounts for more than 70% of the increased production.

Projected production increases for the three export scenarios are smallest under the HOGR case baseline, which requires the lowest amount of added LNG exports given the high levels of production and LNG exports compared to the other baselines. Increased domestic gas production only contributes to around 60% of LNG export-related demand when the export scenarios are implemented using the LOGR case baseline, lower than the share when other baselines are used. This result reflects the relatively high prices placing greater downward pressure on demand and the relative lack of ability of supply to respond to the high prices under the low resource assumptions.

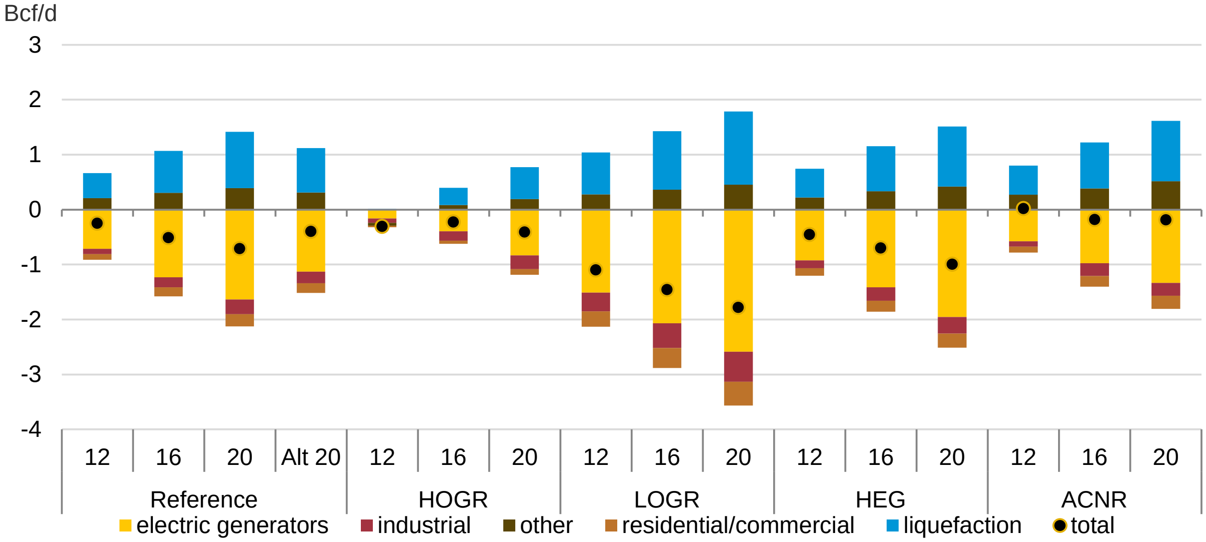
Figure 8. Change in average natural gas supply in the three export scenarios relative to five baseline cases (2015-40)



End-use natural gas consumption response

Across the full range of scenarios and baselines, the end-use consumption response to added LNG exports occurs largely within the electric power sector (Figure 9). Except for the HOGR case baseline, which requires very modest additions to LNG exports to implement the specified export scenarios, the role of demand response tends to rise in the later years of the projection period, particularly for electric generators and the transportation sector. These long-term responses reflect the impact of a sustained change in natural gas prices on investment decisions.

Figure 9. Change in average natural gas consumption in the three export scenarios relative to five baselines (2015-40)

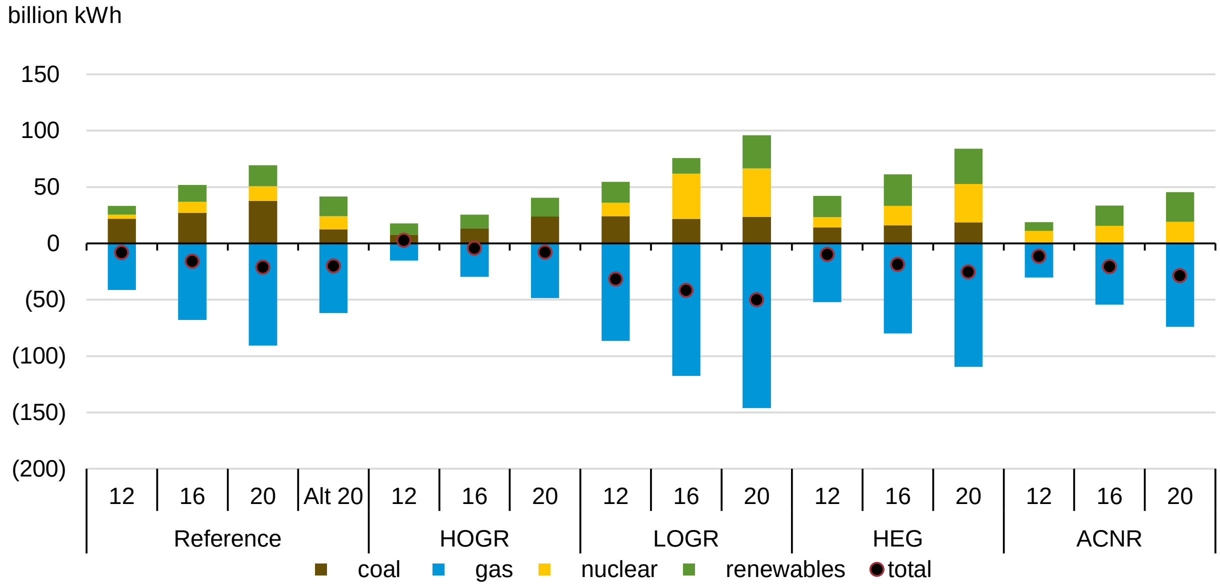


Note: "Other" includes lease and plant fuel, pipeline transportation, and vehicle transportation.

Over the 2015-40 period, the decline in natural gas consumption from electric power generators, on average, contributes from 10% to 18% to the levels of natural gas needed for the increased LNG export demands, across all cases and scenarios. In all the LNG export scenarios and cases, the average change from each respective base scenario in total electric generation over the 2015-40 period is 0% to -1%, responding to end-use electricity prices that increase 0% to 4%.

A combination of demand reduction and increased coal, nuclear, and renewable generation displaces natural gas generation (Figure 10). The tradeoff in natural gas-fired generation and generation from competing fuels varies depending on case, and generally depends on what the generation fuel mix is in the base scenarios. In all cases and scenarios, with the exception of the ACNR case, in the 2015-25 period, the increase in coal-fired generation contributes the largest share of the increase in generation from other sources. After 2025, increases in nuclear and renewable generation make up the largest share in the growth of generation from other fuel in the Reference, LOGR and HEG cases.

Figure 10. Change in average electric power generation in the three export scenarios relative to five baselines (2015-40)



Total energy use, energy-related carbon dioxide emissions, and end-use expenditures

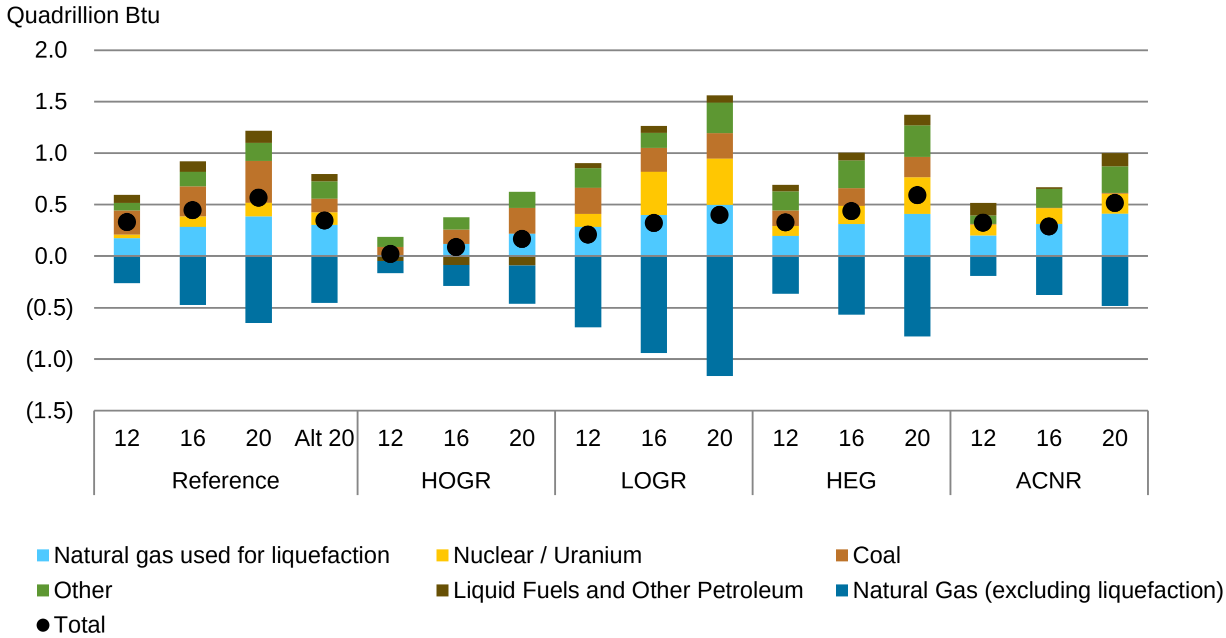
Annual primary energy consumption in the AEO2014 Reference case, measured in British thermal units (Btu), averages 103 quadrillion Btu over the 2015-40 period, with an annual average growth rate of 0.3%. Cumulative carbon dioxide (CO_2) emissions total 143,353 million metric tons over that period.

Primary energy use

Implementation of the specified LNG export scenarios starting from any of the five baselines used in this study raises projected primary energy consumption (Figure 11). The increase in primary energy use is generally on the order of 0.4%, but is lower under the HOGR baseline. This outcome is largely driven by the increased use of natural gas needed to liquefy natural gas for exports. As shown in Table 1, average added LNG exports over the 2015-40 period vary widely across pairings of scenarios and baselines, from 0.1 Bcf/d (HOGR case baseline, 12-Bcf/d scenario) to 13.3 Bcf/d (LOGR case baseline, 20-Bcf/d scenario). With gas consumed in liquefaction roughly 10% of the LNG export volume, in the LOGR case, 1.33 Bcf/d of natural gas, which is equal to 0.50 quadrillion Btu of primary energy consumption annually, is required to support added LNG exports at the high end of the added export range.

Because the heat rate (Btu per kWh) for coal generators generally exceeds that for natural gas generators by a significant margin, the displacement of some natural gas-fired generation by coal-fired generation, as discussed, also results in a net increase in primary energy use.

Figure 11. Change in average total domestic energy use in the three export scenarios relative to five baselines (2015-40)



Energy-related carbon dioxide (CO_2) emissions

The use of natural gas to provide energy for added liquefaction, combined with the displacement of natural gas by more carbon-intensive fuels in end-use sectors, causes an increase in CO_2 emissions over the analysis period in most pairings of export scenarios and baselines (Table 2). In particular, the increased use of coal in the electric power sector and the increased use of liquids in the industrial sector generally result in a net increase in CO_2 emissions. A lower natural gas price environment tends to favor increased coal use in response to higher LNG exports. Factors driving increased CO_2 emissions are dampened in pairings where the amount of added LNG exports is small and where there is limited opportunity or impetus to displace natural gas generation with coal-fired generation. The latter can occur in cases where natural gas prices are relatively high (e.g., the LOGR cases), increasing the viability of higher priced options such as nuclear and renewables, as well as coal. Higher LNG exports serve to exacerbate this response.

Cumulative CO_2 emissions are highest in the HEG baseline, which in support of increased economic activity has the highest electricity and primary energy consumption of all the baseline cases, and in particular has the highest use of liquid fuels and next to highest use of coal. Both the ACNR and LOGR cases have the lowest cumulative CO_2 emissions from 2015-40 and the lowest percent increases in CO_2 emissions from their respective baselines. In the ACNR case, assumptions limit the availability of coal-fired and nuclear electric power capacity, with generation from coal and nuclear in the ACNR baseline 21% and 8%, respectively, below the Reference baseline, on average from 2015-40. Although overall electric generation in the ANCR baseline is lower, the reduction in coal and nuclear generation is offset by increased natural gas-fired and renewable generation. The LOGR baseline has the lowest amount of electricity generation of all the cases, due to the high cost of electricity, driven by the high cost of natural gas. The LOGR baseline also has the highest shares of electric generation from nuclear and renewable sources, which more than offsets the contribution of relatively higher levels of coal-fired generation to CO_2 emissions. Compared to all the cases, nuclear generation grows the highest amount, on average from 2015-40, in each of the LOGR LNG export scenarios.

Despite the CO_2 emission increases projected in the LNG export scenarios, energy-related CO_2 emissions remain below the 2005 level (5,999 million metric tons) in each year of the projection period across all pairings of scenarios and baselines.

Table 2. Cumulative energy-related CO_2 emissions over 2015-40 and difference from baseline for all pairings (million metric tons)

Case	Scenario	Cumulative CO_2 emissions (2015-40)	Difference from base	% Change from base
Reference	baseline	143,353		
	12-Bcf/d	143,901	548	0.4%
	16-Bcf/d	143,940	587	0.4%
	20-Bcf/d	144,157	803	0.6%
	Alt 20-Bcf/d	143,586	232	0.2%
HOGR	baseline	144,842		
	12-Bcf/d	144,836	-6	-0.0%
	16-Bcf/d	145,017	175	0.1%
	20-Bcf/d	145,213	372	0.3%
LOGR	baseline	140,838		
	12-Bcf/d	140,982	143	0.1%
	16-Bcf/d	140,779	-59	-0.0%
	20-Bcf/d	140,661	-177	-0.1%
HEG	baseline	149,362		
	12-Bcf/d	149,606	243	0.2%
	16-Bcf/d	149,536	173	0.1%
	20-Bcf/d	149,486	124	0.1%
ACNR	baseline	136,077		
	12-Bcf/d	136,226	149	0.1%
	16-Bcf/d	136,056	-21	-0.0%
	20-Bcf/d	136,151	73	0.1%

End-use energy expenditures

The AEO2014 Reference case projects annual average end-use energy expenditures of $1,409 billion over the 2015-40 period. Of that, $845 billion per year is spent on liquids, $415 billion on electricity, $140 billion on natural gas, and $9 billion on coal. Implementation of the 12-Bcf/d scenario under Reference case conditions is projected to increase total end-use energy expenditures by $9 billion per year, or 0.6% on average, from 2015-40. For the 20-Bcf/d scenario, total end-use energy expenditures are projected to rise by $18 billion per year, or 1.3% on average, over the same period. Increased end-use expenditures on natural gas account for roughly one-third of additional expenditures.

Similar results apply across the full range of scenarios and baselines. Although implementation of the export scenarios specified by DOE/FE reduces projected natural gas and electricity consumption in domestic end-use sectors, higher prices increase average projected natural gas and electricity bills over the 2015-40 period (Tables 3 and 4).

Expenditures on liquid fuels also increase with added exports across the cases. However, with the exception of the HOGR case, the increase in expenditures on liquid fuels is largely due to an increase in liquid fuels consumption, which occurs primarily in the industrial sector. This reflects both the increasing availability of natural gas liquids as domestic natural gas production grows and higher economic growth.

Table 3. Average natural gas expenditures over 2015-40 and difference from baseline for all pairings (billion U.S. 2012$)

Case	Scenario	Average natural gas expenditures (2015-40)	Difference from base	% Change from base
Reference	baseline	140		
	12-Bcf/d	143	3	1.9%
	16-Bcf/d	145	4	3.2%
	20-Bcf/d	147	6	4.6%
	Alt 20-Bcf/d	145	5	3.7%
HOGR	baseline	123		
	12-Bcf/d	123	0	0.0%
	16-Bcf/d	123	1	0.5%
	20-Bcf/d	125	2	1.5%
LOGR	baseline	159		
	12-Bcf/d	167	8	5.0%
	16-Bcf/d	170	11	6.7%
	20-Bcf/d	172	13	8.4%
HEG	baseline	151		
	12-Bcf/d	154	3	2.3%
	16-Bcf/d	157	6	3.7%
	20-Bcf/d	158	7	4.8%
ACNR	baseline	143		
	12-Bcf/d	146	3	2.4%
	16-Bcf/d	148	5	3.7%
	20-Bcf/d	150	7	5.1%

Table 4. Average electricity expenditures over 2015-40 and difference from baseline for all pairings (billion U.S. 2012$)

Case	Scenario	Average electricity expenditures (2015-40)	Difference from base	% Change from base
Reference	baseline	415		
	12-Bcf/d	419	4	0.9%
	16-Bcf/d	421	6	1.3%
	20-Bcf/d	423	8	1.9%
	Alt 20-Bcf/d	422	6	1.6%
HOGR	baseline	399		
	12-Bcf/d	399	0	0.1%
	16-Bcf/d	399	1	0.2%
	20-Bcf/d	400	2	0.4%
LOGR	baseline	436		
	12-Bcf/d	444	8	1.8%
	16-Bcf/d	447	11	2.5%
	20-Bcf/d	449	13	3.0%
HEG	baseline	446		
	12-Bcf/d	450	4	0.9%
	16-Bcf/d	453	7	1.6%
	20-Bcf/d	455	9	2.0%
ACNR	baseline	435		
	12-Bcf/d	440	5	1.2%
	16-Bcf/d	442	7	1.6%
	20-Bcf/d	444	10	2.2%

Macroeconomic Effects

Macroeconomic considerations related to increased energy exports

U.S. economic output in NEMS represents all domestic goods and services, and net trade of global goods and services. Holding other factors constant, more robust growth in U.S. production of goods and services, including energy, adds to domestic output.

Changes in energy prices can also affect the economy. For example, a reduction in the price of imported energy tends to boost domestic economic activity. Any reduction in global natural gas prices that might occur due to exports of U.S. LNG would tend to stimulate the economies of countries that import gas, increasing their demand for both domestic goods and services and imports sourced from the United States and elsewhere. These effects generally apply across the full range of industries. However, to the extent that an increment to domestic production is concentrated in a particular sector, such as oil and natural gas production, industries that provide inputs to those activities, such as steel pipe and tube and drilling equipment, may realize a disproportionately large boost. Because NEMS does not consider how U.S. LNG exports might change natural gas pricing in overseas markets, or the implications of such changes for non-U.S. economic activity, economic impacts from international markets are not included in this study. Capturing that linkage would require the use of a global macroeconomic model that explicitly includes energy prices.

For energy-intensive industries, energy prices can also affect industrial activity directly through their influence on utilization decisions for existing plants and siting decisions for new ones. All else equal, lower U.S. energy prices and higher energy prices abroad tend to favor greater reliance on production facilities located in the United States. For example, recent success in developing domestic shale gas resources and the consequent availability of price-advantaged natural gas has encouraged both higher capacity utilization and plans for capacity expansion in gas-intensive sectors such as the production of bulk chemicals. To the extent that U.S. LNG exports result in raised domestic prices and reduced prices in other global regions, some of this advantage could be smaller.

Given its domestic focus, however, NEMS does not account for the impact of energy price changes outside of the United States on utilization patterns of existing capacity or the siting of new capacity inside or outside of the United States in energy-intensive industries. Capturing such linkages would likely require a global model of industrial competition in the specific sector(s) of interest.

Economic results from EIA modeling

Increasing LNG exports leads to higher economic output, as measured by real gross domestic product (GDP), as increased energy production spurs investment. This higher economic output is enough to overcome the negative impact of higher domestic energy prices over the projection period. Exchange rates and foreign GDP do not change from their respective baselines when the specified export scenarios are modeled in NEMS, which precludes adjustments that would in reality tend to offset the impact of a rise in overall U.S. prices relative to those trading partners compared to baseline conditions.

Implementing the export scenarios specified for this study increased domestic economic output, measured as GDP, by 0.05% to 0.2% over the 2015-40 period depending on the export scenario.

Investment and consumption lead the GDP gains. As energy prices begin to rise, these gains begin to taper off. Figures 12 and 13 show the GDP and consumption, respectively, for the four export scenarios implemented from a Reference case baseline. As shown in Figure 12, the GDP gains from increasing LNG exports are positive across all cases, although relatively modest.

Figure 12. Real GDP impacts of the export scenarios relative to the Reference baseline, undiscounted and discounted (4% discount rate), billion 2005 dollars

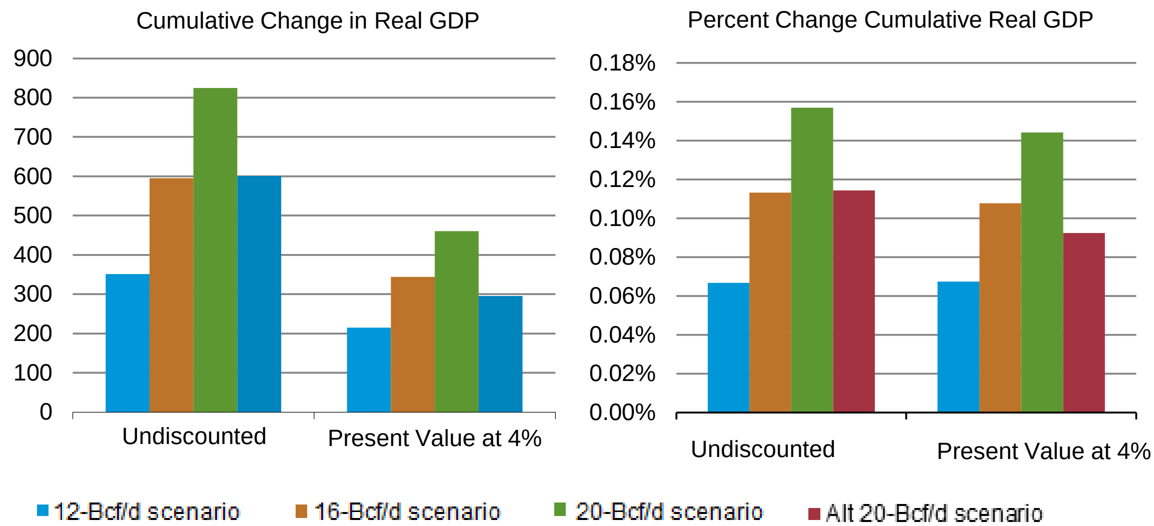
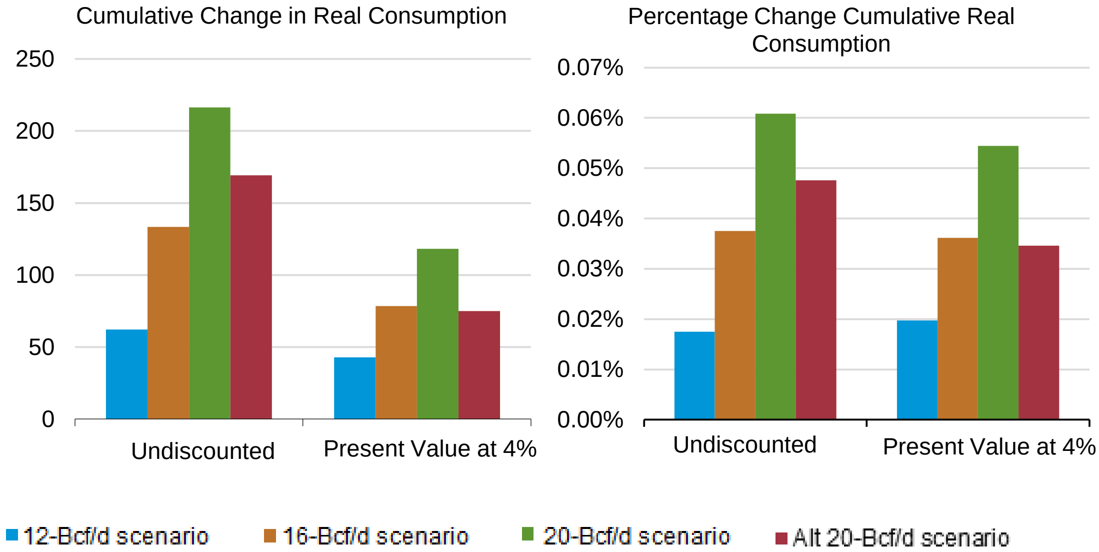


Figure 13. Change in real consumption in the export scenarios compared to the Reference baseline, undiscounted and discounted (4% discount rate), billion 2005 dollars



Industrial shipments generally mirror GDP changes. Energy-intensive industries are challenged by initial energy price increases, but adverse impacts are ameliorated as energy prices return to base levels and GDP begins to increase. Employment changes generally follow both industrial shipments and GDP, although the changes in employment are proportionately less as labor productivity improves.

Results for 12- and 20-Bcf/d scenarios using alternative baselines

Differences in the amount of added energy production explain most of the differences in economic results from implementing the export scenarios when alternative baselines are used. Using the HOGR case as a starting point, real GDP impacts are less as energy production increases to reach the targeted export level (Table 1). Even though energy prices are much higher in the LOGR case, the larger increase in energy production raises the productive capability of the economy enough to offset the negative impacts of higher energy prices.

As elsewhere in this report, the discussion of economic results focuses on changes from baseline when the export scenarios are implemented. This approach is appropriate given the study's aim of assessing the export scenarios rather than differences in the alternative baselines, but readers should always keep in mind that differences across the baselines generally play a much larger role than the export scenarios in driving overall energy market and economic outcomes. Thus, even though the export scenarios provide a bigger boost to economic output using the LOGR case baseline than using the HOGR case baseline, the level of economic output is always higher under the favorable resource and technology conditions of the HOGR case baseline than using the relatively pessimistic LOGR case baseline.

GDP impacts across export scenarios using alternative baselines are uniformly positive, although relatively modest (Figure 14). The average yearly GDP percentage change in the 12-Bcf/d export scenario using alternative base scenarios ranges from 0.01% using the High Resource case to 0.08% using the LOGR case (Figure 14). However, there is relatively little difference in aggregate GDP impacts when comparing the cases other than the LOGR case, primarily because the proportionate differences in energy production and energy prices between those four cases are small. Increasing LNG exports to 20 Bcf/d shows higher GDP changes. However, the ACNR case generally shows slightly higher percentage-change impacts compared to the LOGR case, primarily because prices increase proportionately less in the ACNR 20-Bcf/d scenario compared to the LOGR 20-Bcf/d scenario (Figure 15). The increases in GDP across the export scenarios range from 0.08% to 0.14% using the LOGR case.

Consumption expenditures across export scenarios are generally positive, though smaller in percentage terms than real GDP impacts. Changing energy prices have more of an impact on consumption. For most cases, U.S. consumers increase their consumption expenditures as the positive impacts of increased energy production outweigh energy price changes. As energy prices increase by more than 10% above baseline, then consumption changes become very small to negative in some instances. Consumption gains range from 0.0% to 0.08% and generally increase with the amount of added LNG exports required to fulfill an export scenario for the applicable baseline.

Figure 14. Cumulative and percent change in real GDP in the 12-Bcf/d scenario relative to alternative baselines, billion 2005 dollars

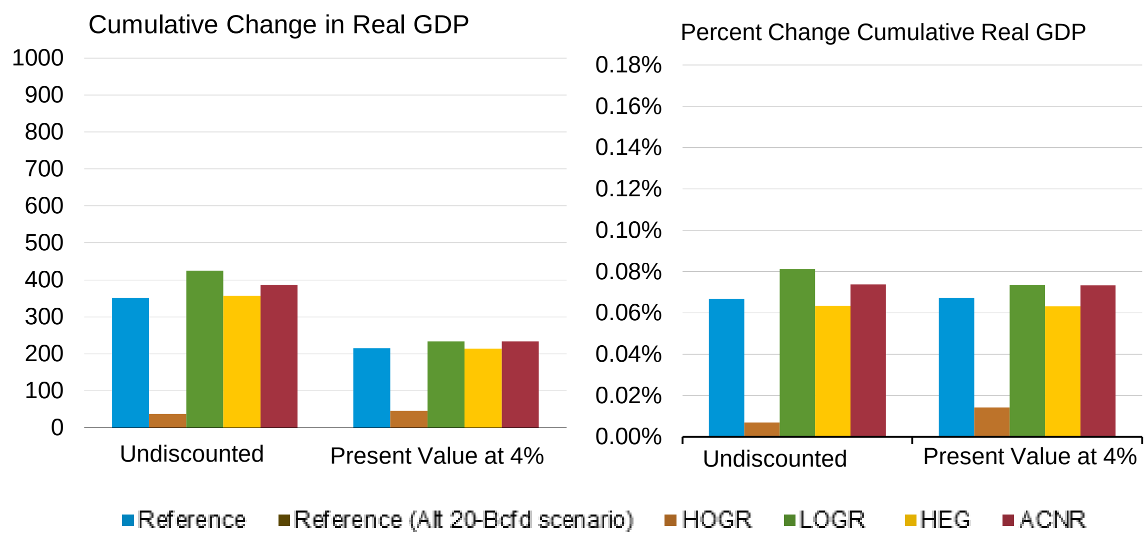
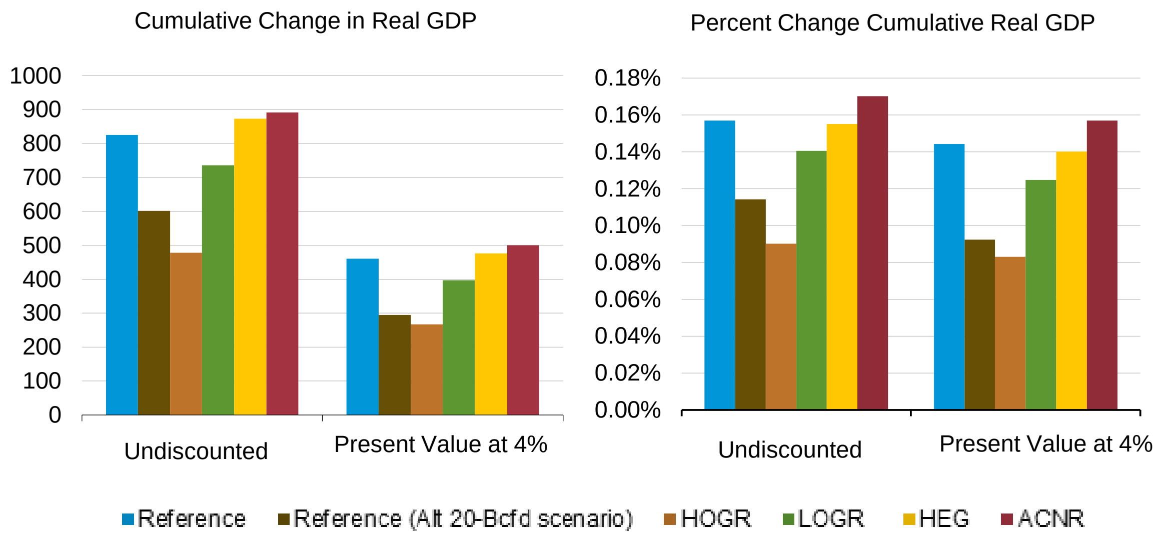


Figure 15. Cumulative and percent change in real GDP in the 20-Bcf/d scenario relative to alternative baselines, billion 2005 dollars



Appendix A. Request Letter

Department of Energy
Washington, DC 20585

May 29, 2014

MEMORANDUM

TO:	ADAM SIEMINSKI ADMINISTRATOR ENERGY INFORMATION ADMINISTRATION
FROM:	CHRISTOPHER SMITH PRINCIPAL DEPUTY ASSISTANT SECRETARY OFFICE OF FOSSIL ENERGY
SUBJECT:	Request for an Update of EIA's January 2012 Study of Liquefied Natural Gas Export Scenarios

The Office of Fossil Energy (FE) requests the Energy Information Administration (EIA) to evaluate the impact of increased natural gas demand, reflecting possible exports of U.S. natural gas, on domestic energy markets using the modeling analysis presented in the *Annual Energy Outlook 2014 (AEO 2014)* as a starting point. The analysis should focus on the implications of additional natural gas demand on domestic energy consumption, production, and prices.

The updated study should address scenarios reflecting increases in export-related natural gas demand representing total lower-48 liquefied natural gas (LNG) exports of 12 billion standard cubic feet per day (Bcf/d), 16 Bcf/d, and 20 Bcf/d phased in at a rate of 2 Bcf/d per year starting in 2015. Understanding that the domestic natural gas market is sensitive to a number of factors, FE requests that EIA include sensitivity cases to explore some of these uncertainties. We are particularly interested in sensitivity cases relating to alternative recovery economics for shale gas resources, as in the *AEO2014 Low and High Resource* cases, a sensitivity case with additional natural gas use for electric generation, and a sensitivity case with increased baseline natural gas demand as in the *AEO2014 High Economic Growth* case.

The study report should review and synthesize the results obtained in the modeling work and include, as needed, discussions of context, caveats, issues and limitations that are relevant to the study. Please include tables or figures that summarize impacts on annual domestic natural gas prices, domestic natural gas production and consumption levels, domestic expenditures for natural gas and other relevant fuels, and revenues associated with the incremental export demand for natural gas. The standard *AEO 2014* reporting tables should also be provided, with the exception of tables reporting information that EIA considers to be spurious or misleading given the limitations of its modeling tools in addressing the study questions.

We would like to receive the completed analysis as soon as possible. We also recognize that EIA may post the study on its website after providing it to us.

Thank you for your attention to this request.

Appendix B. Summary Tables

Table B1. U.S. Annual Averages Values from 2015-40

	Reference					High Oil and Gas Resource				Low Oil and Gas Resource				High Macroeconomic Growth				Accelerated Coal and Nuclear Retirements			
	baseline	12 Bcf	16 Bcf	20 Bcf	Alt 20 Bcf	baseline	12 Bcf	16 Bcf	20 Bcf	baseline	12 Bcf	16 Bcf	20 Bcf	baseline	12 Bcf	16 Bcf	20 Bcf	baseline	12 Bcf	16 Bcf	20 Bcf
NATURAL GAS VOLUMES (Tcf)																					
Net Exports	3.6	5.1	6.1	7.0	6.3	4.9	4.9	5.9	6.8	1.8	4.1	5.0	5.8	3.3	5.0	6.0	7.0	3.2	5.0	6.0	7.0
gross imports	2.2	2.3	2.3	2.3	2.3	2.4	2.5	2.4	2.3	2.6	3.0	3.0	3.1	2.3	2.4	2.4	2.4	2.3	2.4	2.4	2.4
gross exports	5.8	7.5	8.5	9.3	8.6	7.3	7.4	8.3	9.2	4.4	7.0	8.0	8.9	5.6	7.4	8.4	9.3	5.5	7.4	8.4	9.3
Dry Production	32.5	33.9	34.8	35.7	35.1	36.6	36.5	37.5	38.4	27.8	29.7	30.5	31.1	33.8	35.3	36.2	37.1	34.0	35.7	36.7	37.6
shale gas	15.9	17.0	17.6	18.3	17.7	19.7	19.7	19.7	20.2	12.0	13.4	13.9	14.4	16.8	18.0	18.7	19.2	16.9	18.3	19.0	19.6
other	16.6	16.9	17.2	17.4	17.3	17.0	16.8	17.8	18.2	15.8	16.3	16.6	16.8	17.0	17.4	17.6	17.8	17.0	17.5	17.7	18.0
Consumed Volumes (1)	28.8	28.7	28.6	28.5	28.6	31.6	31.5	31.5	31.4	25.9	25.5	25.4	25.2	30.4	30.2	30.1	30.0	30.6	30.6	30.5	30.5
electric generators	9.7	9.5	9.3	9.1	9.3	11.8	11.7	11.6	11.5	7.9	7.3	7.1	6.9	10.5	10.2	10.0	9.8	11.6	11.4	11.3	11.1
industrial	8.4	8.3	8.3	8.3	8.3	8.6	8.6	8.5	8.5	8.1	8.0	7.9	7.9	8.8	8.8	8.7	8.7	8.3	8.3	8.2	8.2
liquefaction	0.3	0.4	0.5	0.6	0.6	0.4	0.4	0.5	0.6	0.2	0.4	0.6	0.7	0.2	0.4	0.5	0.6	0.2	0.4	0.5	0.6
residential	4.3	4.3	4.3	4.3	4.3	4.4	4.4	4.4	4.4	4.3	4.2	4.2	4.2	4.5	4.5	4.5	4.5	4.3	4.3	4.3	4.3
commercial	3.3	3.3	3.2	3.2	3.2	3.4	3.4	3.4	3.4	3.1	3.1	3.1	3.1	3.3	3.3	3.3	3.3	3.3	3.3	3.2	3.2
other	2.8	2.8	2.9	2.9	2.9	3.0	3.0	3.0	3.1	2.4	2.5	2.5	2.5	2.9	3.0	3.0	3.1	2.8	2.9	2.9	3.0
NATURAL GAS END-USE PRICES (2012$/Mcf)																					
residential	13.4	13.7	13.8	14.0	13.9	12.0	12.0	12.1	12.2	15.3	16.1	16.4	16.6	13.8	14.2	14.4	14.5	13.6	13.9	14.1	14.3
commercial	11.0	11.3	11.4	11.6	11.5	9.5	9.6	9.6	9.7	12.9	13.7	14.0	14.2	11.3	11.6	11.8	12.0	11.2	11.6	11.8	11.9
industrial	6.9	7.1	7.3	7.5	7.4	5.5	5.5	5.6	5.7	8.6	9.4	9.7	9.9	7.1	7.4	7.6	7.7	7.2	7.5	7.7	7.8
OTHER PRICES																					
Natural Gas Lower 48 Supply Price (2012$/Mcf)	5.4	5.7	5.8	5.99	5.9	4.0	4.0	4.1	4.2	7.1	7.9	8.2	8.4	5.6	5.9	6.1	6.2	5.7	6.0	6.2	6.3
Northeast (2012$/Mcf)	5.6	5.9	6.0	6.2	6.1	4.1	4.0	3.9	3.9	8.0	8.8	8.9	9.0	5.9	6.2	6.3	6.5	6.0	6.3	6.5	6.6
Gulf Coast (2012$/Mcf)	5.5	5.7	5.9	6.0	5.9	4.0	4.1	4.2	4.3	7.1	7.8	8.1	8.5	5.7	5.9	6.1	6.3	5.7	6.0	6.2	6.4
West Coast (2012$/Mcf)	5.6	5.9	6.0	6.2	6.1	4.4	4.5	4.6	4.7	7.1	7.7	8.0	8.2	5.8	6.1	6.3	6.4	5.9	6.2	6.4	6.4
Coal Minemouth Price (2012$/short-ton)	51.1	51.2	51.2	51.2	51.2	50.3	50.3	50.3	50.3	51.4	51.5	51.5	51.5	51.8	51.9	51.9	51.9	75.6	75.7	75.7	75.7
End-Use Electricity Price (2012 cents/Kwh)	10.4	10.5	10.5	10.6	10.6	9.8	9.8	9.8	9.8	11.1	11.4	11.4	11.5	10.5	10.7	10.8	10.8	11.1	11.2	11.3	11.4
END-USE ENERGY EXPENDITURES (B 2012$)	1,409.2	1,418.4	1,423.0	1,427.7	1,423.5	1,332.3	1,333.7	1,334.7	1,336.8	1,458.8	1,477.0	1,483.1	1,488.7	1,505.7	1,516.6	1,522.7	1,527.4	1,426.0	1,436.7	1,439.6	1,447.2
liquids	845.0	847.9	848.7	849.2	847.6	802.6	803.7	803.7	803.8	855.5	857.8	858.3	859.1	899.2	902.7	903.3	904.8	837.9	840.2	839.0	842.3
natural gas	140.3	143.0	144.8	146.7	145.5	122.7	122.8	123.4	124.5	159.1	166.9	169.7	172.4	151.0	154.4	156.6	158.3	142.8	146.2	148.2	150.1
electricity	415.4	419.0	421.0	423.3	421.8	398.5	398.8	399.2	400.1	435.8	443.8	446.6	448.8	445.7	449.7	453.0	454.5	434.7	439.7	441.8	444.2
coal	8.5	8.5	8.5	8.5	8.5	8.4	8.4	8.4	8.4	8.5	8.5	8.4	8.4	9.8	9.8	9.8	9.8	10.7	10.7	10.6	10.7
END-USE ENERGY CONSUMPTION (quadrillion Btu)	65.4	65.4	65.3	65.3	65.1	67.2	67.1	67.0	67.0	64.3	64.0	63.9	63.8	68.6	68.5	68.4	68.4	64.8	64.8	64.6	64.6
ELECTRIC GENERATION (billion kWh)	4,711.1	4,702.9	4,695.1	4,689.7	4,691.0	4,811.2	4,813.8	4,806.9	4,803.2	4,615.4	4,583.7	4,573.6	4,565.3	4,969.2	4,959.3	4,950.5	4,943.8	4,631.4	4,619.8	4,610.7	4,602.8
coal	1,668.2	1,690.1	1,695.3	1,705.9	1,680.6	1,526.1	1,533.7	1,539.4	1,550.0	1,737.4	1,761.6	1,759.1	1,761.0	1,711.2	1,725.3	1,727.3	1,729.8	1,314.8	1,315.6	1,315.6	1,315.6
gas	1,486.1	1,444.7	1,418.2	1,395.4	1,424.3	1,769.5	1,754.3	1,739.9	1,721.1	1,200.3	1,113.9	1,082.7	1,054.3	1,623.2	1,571.0	1,543.2	1,513.7	1,782.3	1,751.9	1,727.9	1,708.3
nuclear	785.6	789.2	795.4	798.5	797.2	781.0	781.0	781.0	781.0	838.1	850.0	878.4	881.1	808.9	818.0	826.1	842.9	721.9	732.1	736.5	740.4
renewables	728.8	736.5	743.7	747.3	746.4	692.5	702.8	704.6	709.1	797.0	815.6	810.8	826.3	782.9	802.0	811.0	814.4	771.4	779.2	789.6	797.5
other	42.4	42.5	42.5	42.6	42.5	42.1	42.1	42.0	42.1	42.6	42.6	42.6	42.6	42.9	43.0	43.0	43.0	41.1	41.0	41.0	41.0
PRIMARY ENERGY (quadrillion Btu)																					
Consumption	102.6	102.9	103.0	103.1	102.9	104.4	104.4	104.5	104.6	101.3	101.6	101.7	101.7	107.2	107.6	107.7	107.8	100.2	100.5	100.4	100.7
liquids	36.0	36.1	36.1	36.1	36.1	36.9	36.8	36.8	36.8	35.8	35.9	35.9	35.9	37.5	37.6	37.6	37.7	35.8	35.9	35.8	35.9
natural gas	29.4	29.3	29.2	29.1	29.2	32.3	32.2	32.2	32.1	26.5	26.1	25.9	25.8	31.0	30.8	30.8	30.6	31.3	31.3	31.2	31.2
coal	18.8	19.0	19.1	19.2	18.9	17.3	17.4	17.4	17.5	19.5	19.7	19.7	19.7	19.4	19.6	19.6	19.6	15.0	15.0	15.0	15.0
other	18.4	18.5	18.6	18.7	18.7	18.0	18.1	18.1	18.1	19.6	19.9	20.2	20.3	19.2	19.5	19.7	19.9	18.1	18.3	18.4	18.6
Production	97.1	99.1	100.2	101.3	100.3	108.4	108.4	109.4	110.5	91.7	94.3	95.4	96.3	100.1	102.3	103.4	104.5	93.9	96.2	97.2	98.4
ENERGY RELATED CO2 EMISSIONS (including liquefaction) (million metric tons)	5,514	5,535	5,536	5,544	5,523	5,571	5,571	5,578	5,585	5,417	5,422	5,415	5,410	5,745	5,754	5,751	5,749	5,234	5,239	5,233	5,237
ECONOMIC INDICATORS																					
Gross Domestic Product (B 2005 chain-weighted $)	20,223	20,236	20,246	20,254	20,246	20,386	20,388	20,396	20,404	20,144	20,160	20,167	20,172	21,646	21,660	21,670	21,680	20,163	20,177	20,188	20,197
Total industrial shipments (B 2005$)	9,118	9,133	9,135	9,136	9,125	9,399	9,401	9,398	9,396	8,967	8,966	8,964	8,962	10,190	10,204	10,204	10,209	9,063	9,082	9,077	9,091
Non-farm employment (millions)	156	156	156	156	156	156	156	156	157	155	155	155	155	162	163	163	163	155	156	156	156
Annual change in Consumer Price Index	2.1%	2.1%	2.1%	2.1%	2.1%	2.0%	2.0%	2.0%	2.0%	2.2%	2.2%	2.2%	2.2%	1.8%	1.8%	1.8%	1.8%	2.1%	2.1%	2.1%	2.1%

Table B2. Differential from Base in U.S. Annual Average Values from 2015-40 when Exports are Added

	Reference					High Oil and Gas Resource				Low Oil and Gas Resource				High Macroeconomic Growth				Accelerated Coal and Nuclear Retirements			
	baseline	12 Bcf	16 Bcf	20 Bcf	Alt 20 Bcf	baseline	12 Bcf	16 Bcf	20 Bcf	baseline	12 Bcf	16 Bcf	20 Bcf	baseline	12 Bcf	16 Bcf	20 Bcf	baseline	12 Bcf	16 Bcf	20 Bcf
NATURAL GAS VOLUMES (Tcf)																					
Net Exports		1.5	2.5	3.5	2.7		(0.0)	1.0	1.9		2.3	3.2	4.0		1.7	2.7	3.7		1.8	2.8	3.7
gross imports		0.2	0.1	0.1	0.1		0.1	0.0	(0.0)		0.3	0.3	0.4		0.1	0.1	0.1		0.1	0.1	0.1
gross exports		1.7	2.7	3.6	2.8		0.1	1.0	1.9		2.6	3.6	4.4		1.9	2.8	3.8		1.9	2.9	3.8
Dry Production		1.4	2.4	3.2	2.6		(0.1)	0.9	1.7		1.9	2.7	3.3		1.6	2.5	3.3		1.8	2.7	3.7
shale gas		1.1	1.8	2.4	1.9		0.1	0.1	0.5		1.3	1.9	2.3		1.2	1.9	2.5		1.3	2.0	2.7
other		0.3	0.6	0.8	0.7		(0.2)	0.8	1.2		0.5	0.8	1.0		0.4	0.6	0.9		0.4	0.7	1.0
Consumed Volumes (1)		(0.1)	(0.2)	(0.3)	(0.1)		(0.1)	(0.1)	(0.1)		(0.4)	(0.5)	(0.6)		(0.2)	(0.3)	(0.4)		0.0	(0.1)	(0.1)
electric generators		(0.3)	(0.4)	(0.6)	(0.4)		(0.1)	(0.1)	(0.3)		(0.6)	(0.8)	(0.9)		(0.3)	(0.5)	(0.7)		(0.2)	(0.4)	(0.5)
industrial		(0.0)	(0.1)	(0.1)	(0.1)		(0.0)	(0.1)	(0.1)		(0.1)	(0.2)	(0.2)		(0.1)	(0.1)	(0.1)		(0.0)	(0.1)	(0.1)
liquefaction		0.2	0.3	0.4	0.3		0.0	0.1	0.2		0.3	0.4	0.5		0.2	0.3	0.4		0.2	0.3	0.4
residential		(0.0)	(0.0)	(0.0)	(0.0)		(0.0)	(0.0)	(0.0)		(0.0)	(0.1)	(0.1)		(0.0)	(0.0)	(0.0)		(0.0)	(0.0)	(0.0)
commercial		(0.0)	(0.0)	(0.0)	(0.0)		(0.0)	(0.0)	(0.0)		(0.1)	(0.1)	(0.1)		(0.0)	(0.0)	(0.1)		(0.0)	(0.0)	(0.1)
other		0.1	0.1	0.1	0.1		(0.0)	0.0	0.1		0.1	0.1	0.2		0.1	0.1	0.2		0.1	0.1	0.2
NATURAL GAS END-USE PRICES (2012$/Mcf)																					
residential		0.3	0.5	0.6	0.5		0.1	0.1	0.2		0.8	1.1	1.4		0.3	0.5	0.7		0.3	0.5	0.7
commercial		0.3	0.4	0.6	0.5		0.0	0.1	0.2		0.8	1.1	1.3		0.3	0.5	0.7		0.3	0.5	0.7
industrial		0.2	0.4	0.6	0.5		0.0	0.1	0.2		0.8	1.0	1.3		0.3	0.5	0.6		0.3	0.5	0.6
OTHER PRICES																					
Natural Gas Lower 48 Supply Price (2012$/Mcf)		0.2	0.4	0.57	0.5		(0.0)	0.0	0.1		0.7	1.0	1.3		0.3	0.5	0.6		0.3	0.5	0.6
Northeast (2012$/Mcf)		0.3	0.4	0.5	0.4		(0.1)	(0.2)	(0.2)		0.8	1.0	1.0		0.3	0.4	0.6		0.3	0.5	0.7
Gulf Coast (2012$/Mcf)		0.2	0.4	0.6	0.5		0.0	0.1	0.3		0.7	1.0	1.4		0.3	0.5	0.6		0.3	0.5	0.6
West Coast (2012$/Mcf)		0.3	0.4	0.5	0.5		0.1	0.2	0.3		0.6	1.0	1.2		0.3	0.5	0.6		0.3	0.5	0.5
Coal Minemouth Price (2012$/short-ton)		0.1	0.1	0.1	0.1		(0.0)	0.0	(0.0)		0.1	0.1	0.0		0.1	0.1	0.1		0.1	0.1	0.1
End-Use Electricity Price (2012 cents/Kwh)		0.1	0.2	0.2	0.2		0.0	0.0	0.1		0.3	0.4	0.4		0.1	0.2	0.3		0.2	0.2	0.3
END-USE ENERGY EXPENDITURES (B 2012$)		9.1	13.8	18.5	14.2		1.5	2.4	4.5		18.2	24.3	29.9		11.0	17.0	21.7		10.7	13.6	21.2
liquids		2.9	3.7	4.2	2.6		1.1	1.1	1.1		2.3	2.9	3.6		3.5	4.1	5.6		2.3	1.1	4.4
natural gas		2.7	4.5	6.4	5.1		0.0	0.6	1.8		7.9	10.7	13.3		3.5	5.6	7.3		3.4	5.3	7.3
electricity		3.6	5.6	7.9	6.5		0.3	0.7	1.6		8.0	10.8	13.0		4.0	7.3	8.8		5.0	7.1	9.5
coal		0.0	0.0	0.0	0.0		0.0	0.0	0.0		(0.0)	(0.0)	(0.0)		0.0	0.0	0.0		0.0	(0.0)	(0.0)
END-USE ENERGY CONSUMPTION (quadrillion Btu)		(0.0)	(0.1)	(0.2)	(0.3)		(0.1)	(0.2)	(0.2)		(0.3)	(0.4)	(0.4)		(0.1)	(0.2)	(0.2)		(0.0)	(0.2)	(0.1)
ELECTRIC GENERATION (billion kWh)		(8.1)	(15.9)	(21.3)	(20.1)		2.6	(4.3)	(7.9)		(31.7)	(41.8)	(50.1)		(9.9)	(18.6)	(25.4)		(11.6)	(20.7)	(28.6)
coal		21.9	27.1	37.8	12.4		7.6	13.3	23.9		24.2	21.7	23.6		14.1	16.1	18.6		0.8	0.8	0.8
gas		(41.4)	(67.9)	(90.7)	(61.8)		(15.2)	(29.6)	(48.4)		(86.5)	(117.7)	(146.1)		(52.2)	(80.0)	(109.5)		(30.4)	(54.4)	(74.0)
nuclear		3.6	9.8	12.9	11.6		(0.0)	(0.0)	(0.0)		11.9	40.3	43.0		9.1	17.2	34.0		10.2	14.6	18.5
renewables		7.7	14.9	18.6	17.6		10.3	12.1	16.6		18.6	13.8	29.3		19.1	28.1	31.5		7.8	18.3	26.1
other		0.1	0.1	0.1	0.0		(0.0)	(0.1)	(0.0)		0.1	0.0	0.0		0.0	0.1	0.1		(0.0)	(0.0)	(0.0)
PRIMARY ENERGY (quadrillion Btu)																					
Consumption		0.3	0.4	0.6	0.3		0.0	0.1	0.2		0.2	0.3	0.4		0.3	0.4	0.6		0.3	0.3	0.5
liquids		0.1	0.1	0.1	0.1		(0.0)	(0.1)	(0.1)		0.0	0.1	0.1		0.1	0.1	0.1		0.1	0.0	0.1
natural gas		(0.1)	(0.2)	(0.3)	(0.1)		(0.1)	(0.1)	(0.2)		(0.4)	(0.5)	(0.7)		(0.2)	(0.3)	(0.4)		0.0	(0.1)	(0.1)
coal		0.2	0.3	0.4	0.1		0.1	0.1	0.3		0.3	0.2	0.2		0.2	0.2	0.2		0.0	0.0	0.0
other		0.1	0.2	0.3	0.3		0.1	0.1	0.2		0.3	0.6	0.7		0.3	0.5	0.7		0.2	0.3	0.5
Production		1.9	3.1	4.2	3.2		(0.0)	1.1	2.1		2.6	3.7	4.6		2.2	3.3	4.4		2.2	3.3	4.5
ENERGY RELATED CO2 EMISSIONS (including liquefaction) (million metric tons)		21	23	31	9		(0)	7	14		6	(2)	(7)		9	7	5		6	(1)	3
ECONOMIC INDICATORS																					
Gross Domestic Product (B 2005 chain-weighted $)		14	23	32	23		1	10	18		16	23	28		14	24	34		15	25	34
Total industrial shipments (B 2005$)		15	17	18	7		2	(1)	(3)		(1)	(2)	(5)		13	14	18		19	14	29
Non-farm employment (millions)		0.1	0.1	0.2	0.1		0	0	0		0	0	0		0	0	0		0	0	0
Annual change in Consumer Price Index		0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%		0.0%	0.0%	0.0%		0.0%	0.0%	0.0%		0.0%	0.0%	0.0%

Table B3. Differential (%) from Base in U.S. Annual Average Values from 2015-40 when Exports are Added

	Reference					High Oil and Gas Resource				Low Oil and Gas Resource				High Macroeconomic Growth				Accelerated Coal and Nuclear Retirements			
	baseline	12 Bcf	16 Bcf	20 Bcf	Alt 20 Bcf	baseline	12 Bcf	16 Bcf	20 Bcf	baseline	12 Bcf	16 Bcf	20 Bcf	baseline	12 Bcf	16 Bcf	20 Bcf	baseline	12 Bcf	16 Bcf	20 Bcf
NATURAL GAS VOLUMES (Tcf)																					
Net Exports		42.4%	70.8%	96.1%	76.3%		-0.5%	20.0%	38.4%		126.9%	179.6%	221.7%		52.8%	83.2%	111.3%		54.9%	85.7%	114.7%
gross imports		7.1%	6.3%	5.4%	4.1%		4.0%	0.1%	-0.8%		11.6%	12.7%	16.8%		5.9%	4.5%	4.9%		5.1%	4.8%	4.7%
gross exports		29.1%	46.5%	61.8%	49.1%		0.9%	13.6%	25.7%		58.2%	80.2%	99.7%		33.8%	51.2%	68.1%		34.5%	52.6%	69.6%
Dry Production		4.4%	7.3%	9.8%	8.0%		-0.4%	2.5%	4.8%		6.8%	9.7%	12.0%		4.7%	7.4%	9.8%		5.3%	8.0%	10.8%
shale gas		7.0%	11.2%	15.1%	11.7%		0.3%	0.4%	2.6%		11.2%	15.8%	19.4%		7.2%	11.2%	14.6%		7.9%	12.1%	15.8%
other		2.0%	3.5%	4.8%	4.4%		-1.1%	4.9%	7.2%		3.4%	5.0%	6.4%		2.2%	3.6%	5.0%		2.6%	4.0%	5.8%
Consumed Volumes (1)		-0.3%	-0.6%	-0.9%	-0.5%		-0.4%	-0.3%	-0.5%		-1.5%	-2.1%	-2.5%		-0.5%	-0.8%	-1.2%		0.0%	-0.2%	-0.2%
electric generators		-2.7%	-4.6%	-6.1%	-4.2%		-0.5%	-1.2%	-2.6%		-7.0%	-9.6%	-12.0%		-3.2%	-4.9%	-6.8%		-1.8%	-3.1%	-4.2%
industrial		-0.4%	-0.8%	-1.1%	-0.9%		-0.3%	-0.7%	-1.1%		-1.6%	-2.0%	-2.5%		-0.6%	-1.0%	-1.3%		-0.4%	-1.0%	-1.0%
liquefaction		62.0%	102.5%	138.9%	109.2%		1.3%	29.3%	54.5%		168.0%	234.2%	293.5%		76.8%	120.7%	160.1%		79.0%	123.5%	163.5%
residential		-0.4%	-0.6%	-0.8%	-0.6%		-0.1%	-0.2%	-0.4%		-1.0%	-1.3%	-1.6%		-0.5%	-0.7%	-0.9%		-0.4%	-0.7%	-0.8%
commercial		-0.7%	-1.1%	-1.5%	-1.2%		-0.2%	-0.3%	-0.6%		-1.8%	-2.4%	-2.8%		-0.9%	-1.2%	-1.6%		-0.7%	-1.3%	-1.5%
other		2.7%	4.1%	5.1%	4.1%		-0.6%	1.0%	2.3%		4.3%	5.6%	7.0%		2.8%	4.2%	5.3%		3.5%	5.0%	6.7%
NATURAL GAS END-USE PRICES (2012$/Mcf)																					
residential		2.1%	3.4%	4.8%	3.9%		0.7%	1.2%	2.0%		5.5%	7.3%	8.9%		2.5%	3.9%	5.1%		2.5%	4.0%	5.3%
commercial		2.5%	4.0%	5.7%	4.6%		0.4%	0.9%	1.8%		6.3%	8.5%	10.2%		2.9%	4.6%	6.0%		2.9%	4.8%	6.2%
industrial		3.6%	6.2%	8.8%	7.1%		0.5%	2.1%	4.4%		8.9%	12.2%	15.3%		4.4%	7.0%	9.0%		4.2%	6.9%	9.1%
OTHER PRICES																					
Natural Gas Lower 48 Supply Price (2012$/Mcf)		4.3%	7.4%	10.6%	8.6%		-0.7%	0.8%	3.2%		10.4%	14.4%	17.9%		5.0%	8.2%	10.6%		5.0%	8.3%	10.9%
Northeast (2012$/Mcf)		4.5%	6.6%	9.2%	7.3%		-3.2%	-5.2%	-4.9%		10.2%	12.3%	13.1%		4.6%	7.4%	10.0%		5.9%	8.6%	11.6%
Gulf Coast (2012$/Mcf)		3.9%	7.1%	10.4%	8.7%		0.5%	3.4%	6.7%		10.2%	14.8%	19.0%		4.8%	8.2%	10.5%		5.0%	8.3%	11.0%
West Coast (2012$/Mcf)		4.7%	6.9%	9.7%	8.2%		2.5%	4.5%	6.5%		9.0%	13.6%	16.7%		5.6%	8.1%	9.9%		5.4%	7.8%	9.0%
Coal Minemouth Price (2012$/short-ton)		0.2%	0.2%	0.1%	0.1%		-0.1%	0.1%	0.0%		0.1%	0.1%	0.1%		0.1%	0.2%	0.3%		0.1%	0.2%	0.1%
End-Use Electricity Price (2012 cents/Kwh)		1.0%	1.6%	2.3%	1.9%		0.0%	0.2%	0.6%		2.4%	3.3%	3.9%		1.1%	2.1%	2.5%		1.4%	2.1%	2.7%
END-USE ENERGY EXPENDITURES (B 2012$)		0.6%	1.0%	1.3%	1.0%		0.1%	0.2%	0.3%		1.2%	1.7%	2.0%		0.7%	1.1%	1.4%		0.8%	1.0%	1.5%
liquids		0.3%	0.4%	0.5%	0.3%		0.1%	0.1%	0.1%		0.3%	0.3%	0.4%		0.4%	0.5%	0.6%		0.3%	0.1%	0.5%
natural gas		1.9%	3.2%	4.6%	3.7%		0.0%	0.5%	1.5%		5.0%	6.7%	8.4%		2.3%	3.7%	4.8%		2.4%	3.7%	5.1%
electricity		0.9%	1.3%	1.9%	1.6%		0.1%	0.2%	0.4%		1.8%	2.5%	3.0%		0.9%	1.6%	2.0%		1.2%	1.6%	2.2%
coal		0.4%	0.3%	0.3%	0.1%		0.2%	0.2%	0.2%		-0.3%	-0.4%	-0.6%		0.2%	0.1%	0.2%		0.1%	0.0%	0.0%
END-USE ENERGY CONSUMPTION (quadrillion Btu)		-0.1%	-0.2%	-0.3%	-0.5%		-0.1%	-0.2%	-0.4%		-0.4%	-0.6%	-0.7%		-0.1%	-0.3%	-0.3%		0.0%	-0.4%	-0.2%
ELECTRIC GENERATION (billion kWh)		-0.2%	-0.3%	-0.5%	-0.4%		0.1%	-0.1%	-0.2%		-0.7%	-0.9%	-1.1%		-0.2%	-0.4%	-0.5%		-0.3%	-0.4%	-0.6%
coal		1.3%	1.6%	2.3%	0.7%		0.5%	0.9%	1.6%		1.4%	1.2%	1.4%		0.8%	0.9%	1.1%		0.1%	0.1%	0.1%
gas		-2.8%	-4.6%	-6.1%	-4.2%		-0.9%	-1.7%	-2.7%		-7.2%	-9.8%	-12.2%		-3.2%	-4.9%	-6.7%		-1.7%	-3.1%	-4.1%
nuclear		0.5%	1.2%	1.6%	1.5%		0.0%	0.0%	0.0%		1.4%	4.8%	5.1%		1.1%	2.1%	4.2%		1.4%	2.0%	2.6%
renewables		1.1%	2.0%	2.5%	2.4%		1.5%	1.8%	2.4%		2.3%	1.7%	3.7%		2.4%	3.6%	4.0%		1.0%	2.4%	3.4%
other		0.2%	0.2%	0.3%	0.1%		-0.1%	-0.3%	-0.1%		0.1%	0.1%	0.1%		0.1%	0.2%	0.1%		0.0%	-0.1%	0.0%
PRIMARY ENERGY (quadrillion Btu)																					
Consumption		0.3%	0.4%	0.6%	0.3%		0.0%	0.1%	0.2%		0.2%	0.3%	0.4%		0.3%	0.4%	0.6%		0.3%	0.3%	0.5%
liquids		0.2%	0.3%	0.3%	0.2%		-0.1%	-0.2%	-0.2%		0.1%	0.2%	0.2%		0.2%	0.2%	0.3%		0.3%	0.0%	0.4%
natural gas		-0.3%	-0.6%	-0.9%	-0.5%		-0.4%	-0.3%	-0.5%		-1.5%	-2.1%	-2.5%		-0.5%	-0.8%	-1.2%		0.0%	-0.2%	-0.2%
coal		1.2%	1.5%	2.1%	0.7%		0.5%	0.8%	1.4%		1.3%	1.2%	1.3%		0.8%	0.9%	1.0%		0.0%	0.0%	0.0%
other		0.6%	1.3%	1.7%	1.6%		0.6%	0.7%	0.9%		1.6%	2.9%	3.8%		1.4%	2.3%	3.4%		1.0%	1.8%	2.5%
Production		2.0%	3.2%	4.3%	3.3%		0.0%	1.0%	1.9%		2.8%	4.1%	5.0%		2.1%	3.3%	4.4%		2.4%	3.5%	4.8%
ENERGY RELATED CO2 EMISSIONS (including liquefaction) (million metric tons)		0.4%	0.4%	0.6%	0.2%		0.0%	0.1%	0.3%		0.1%	0.0%	-0.1%		0.2%	0.1%	0.1%		0.1%	0.0%	0.1%
ECONOMIC INDICATORS																					
Gross Domestic Product (B 2005 chain-weighted $)		0.1%	0.1%	0.2%	0.1%		0.0%	0.0%	0.1%		0.1%	0.1%	0.1%		0.1%	0.1%	0.2%		0.1%	0.1%	0.2%
Total industrial shipments (B 2005$)		0.2%	0.2%	0.2%	0.1%		0.0%	0.0%	0.0%		0.0%	0.0%	-0.1%		0.1%	0.1%	0.2%		0.2%	0.2%	0.3%
Non-farm employment (millions)		0.1%	0.1%	0.1%	0.1%		0.0%	0.0%	0.1%		0.1%	0.1%	0.1%		0.1%	0.1%	0.1%		0.1%	0.1%	0.1%
Annual change in Consumer Price Index		0.0%	0.2%	0.4%	0.3%		0.0%	-0.4%	-0.6%		0.0%	0.3%	0.4%		0.2%	0.3%	0.6%		0.3%	0.1%	0.4%

Table B4. U.S. Annual Averages Values from 2015-25

	Reference					High Oil and Gas Resource				Low Oil and Gas Resource				High Macroeconomic Growth				Accelerated Coal and Nuclear Retirements			
	baseline	12 Bcf	16 Bcf	20 Bcf	Alt 20 Bcf	baseline	12 Bcf	16 Bcf	20 Bcf	baseline	12 Bcf	16 Bcf	20 Bcf	baseline	12 Bcf	16 Bcf	20 Bcf	baseline	12 Bcf	16 Bcf	20 Bcf
NATURAL GAS VOLUMES (Tcf)																					
Net Exports	1.5	3.0	3.6	3.9	2.2	1.9	2.9	3.4	3.7	0.7	2.7	3.3	3.6	1.4	3.0	3.6	3.9	1.3	3.0	3.6	3.9
gross imports	2.5	2.6	2.6	2.6	2.5	2.6	2.7	2.7	2.7	2.6	2.8	2.9	2.9	2.5	2.6	2.6	2.6	2.5	2.6	2.6	2.6
gross exports	3.9	5.6	6.2	6.5	4.7	4.5	5.6	6.1	6.5	3.3	5.6	6.2	6.5	3.9	5.6	6.2	6.5	3.9	5.6	6.2	6.5
Dry Production	28.6	30.2	30.7	30.9	29.3	30.9	31.8	32.3	32.5	26.5	28.3	28.8	29.1	29.5	31.1	31.6	31.8	29.7	31.6	32.1	32.4
shale gas	13.0	14.2	14.5	14.7	13.5	14.7	15.4	15.7	15.8	11.3	12.7	13.0	13.2	13.7	14.8	15.2	15.4	13.9	15.5	15.7	16.0
other	15.6	16.0	16.2	16.2	15.8	16.2	16.4	16.6	16.7	15.2	15.6	15.8	15.9	15.9	16.2	16.3	16.4	15.8	16.2	16.4	16.4
Consumed Volumes (1)	27.1	27.0	27.0	26.9	27.0	28.9	28.8	28.7	28.6	25.7	25.4	25.4	25.3	28.0	27.9	27.9	27.9	28.3	28.5	28.4	28.4
electric generators	8.8	8.6	8.5	8.4	8.7	10.3	10.0	9.9	9.8	7.9	7.5	7.4	7.4	9.4	9.1	9.1	9.0	10.1	10.0	9.9	9.9
industrial	8.1	8.1	8.0	8.0	8.1	8.2	8.2	8.1	8.1	8.0	7.9	7.8	7.8	8.3	8.3	8.3	8.2	8.0	8.0	8.0	8.0
liquefaction	0.2	0.3	0.4	0.4	0.3	0.2	0.3	0.4	0.4	0.1	0.3	0.4	0.4	0.2	0.3	0.4	0.4	0.2	0.3	0.4	0.4
residential	4.5	4.4	4.4	4.4	4.5	4.5	4.5	4.5	4.5	4.4	4.4	4.4	4.4	4.5	4.5	4.5	4.5	4.5	4.4	4.4	4.4
commercial	3.2	3.1	3.1	3.1	3.2	3.3	3.2	3.2	3.2	3.1	3.0	3.0	3.0	3.2	3.1	3.1	3.1	3.2	3.1	3.1	3.1
other	2.3	2.4	2.5	2.5	2.4	2.4	2.5	2.5	2.5	2.2	2.3	2.3	2.4	2.4	2.5	2.5	2.5	2.4	2.5	2.6	2.6
NATURAL GAS END-USE PRICES (2012$/Mcf)																					
residential	11.9	12.1	12.2	12.3	12.1	11.0	11.2	11.3	11.4	12.7	13.6	13.8	14.0	12.1	12.5	12.7	12.7	12.0	12.2	12.4	12.4
commercial	9.8	10.0	10.1	10.2	10.0	8.8	8.9	9.0	9.1	10.6	11.4	11.6	11.8	9.9	10.2	10.4	10.5	9.9	10.0	10.3	10.3
industrial	5.9	6.1	6.2	6.4	6.1	5.2	5.4	5.5	5.7	6.7	7.5	7.7	8.0	6.0	6.2	6.4	6.6	6.1	6.2	6.5	6.5
OTHER PRICES																					
Natural Gas Lower 48 Supply Price (2012$/Mcf)	4.4	4.5	4.7	4.8	4.5	3.6	3.7	3.8	3.9	5.1	5.9	6.1	6.4	4.4	4.7	4.8	4.9	4.5	4.6	4.8	4.9
Northeast (2012$/Mcf)	4.3	4.4	4.5	4.5	4.5	2.7	2.7	2.6	2.6	5.3	6.0	6.0	6.1	4.3	4.6	4.7	4.7	4.4	4.5	4.6	4.5
Gulf Coast (2012$/Mcf)	4.4	4.6	4.7	4.9	4.6	3.9	4.0	4.2	4.4	5.2	6.0	6.2	6.5	4.5	4.7	4.9	5.0	4.6	4.8	5.0	5.1
West Coast (2012$/Mcf)	4.7	4.8	4.9	5.0	4.8	4.2	4.4	4.5	4.6	5.3	6.0	6.3	6.5	4.7	5.0	5.2	5.2	4.8	4.9	5.1	5.2
Coal Minemouth Price (2012$/short-ton)	46.1	46.2	46.2	46.2	46.2	45.3	45.3	45.4	45.3	46.5	46.8	46.8	46.7	46.5	46.6	46.7	46.7	55.6	55.8	55.8	55.7
End-Use Electricity Price (2012 cents/Kwh)	10.0	10.1	10.1	10.2	10.1	9.8	9.8	9.8	9.8	10.3	10.6	10.7	10.8	10.1	10.2	10.3	10.3	10.4	10.5	10.5	10.6
END-USE ENERGY EXPENDITURES (B 2012$)	1,290.0	1,296.3	1,300.0	1,302.3	1,295.0	1,249.1	1,253.7	1,257.2	1,260.8	1,318.0	1,338.1	1,343.6	1,348.6	1,336.8	1,345.3	1,350.9	1,353.3	1,297.2	1,302.7	1,306.3	1,311.1
liquids	784.4	786.3	787.1	787.2	785.2	759.4	761.9	762.5	764.1	794.8	797.2	797.6	798.0	813.5	815.4	816.0	816.4	780.2	781.0	780.8	783.1
natural gas	119.2	121.4	122.9	124.2	121.4	110.2	111.5	113.1	114.3	128.1	137.4	139.9	142.3	122.4	125.9	128.1	129.4	120.5	122.3	124.8	125.2
electricity	378.2	380.2	381.6	382.6	380.0	371.2	372.0	373.3	374.1	386.7	395.2	397.7	400.0	391.8	395.0	397.7	398.3	387.2	390.1	391.5	393.6
coal	8.3	8.4	8.4	8.4	8.4	8.3	8.3	8.3	8.3	8.4	8.4	8.4	8.4	9.1	9.1	9.1	9.1	9.2	9.2	9.2	9.2
END-USE ENERGY CONSUMPTION (quadrillion Btu)	64.7	64.7	64.7	64.6	64.4	65.7	65.6	65.5	65.5	64.3	64.0	63.9	63.9	66.5	66.4	66.3	66.3	64.3	64.3	64.2	64.3
ELECTRIC GENERATION (billion kWh)	4,407.5	4,403.2	4,399.3	4,397.5	4,403.7	4,455.8	4,451.4	4,447.8	4,445.5	4,376.1	4,348.2	4,340.7	4,336.0	4,539.8	4,532.8	4,526.7	4,523.7	4,370.9	4,368.7	4,360.6	4,352.9
coal	1,643.4	1,671.7	1,677.7	1,688.3	1,655.0	1,515.5	1,536.1	1,544.5	1,552.1	1,712.0	1,740.3	1,740.2	1,741.5	1,676.6	1,698.1	1,699.4	1,701.5	1,403.1	1,403.8	1,403.8	1,403.8
gas	1,274.3	1,238.5	1,223.6	1,211.2	1,253.4	1,473.0	1,436.0	1,421.8	1,408.7	1,146.2	1,083.5	1,071.4	1,063.1	1,363.9	1,327.2	1,317.2	1,308.0	1,456.7	1,448.2	1,435.3	1,426.4
nuclear	783.3	783.3	783.3	783.3	783.3	783.3	783.3	783.3	783.3	793.2	793.3	796.7	796.8	783.5	783.5	783.3	786.4	783.3	783.3	783.3	783.3
renewables	664.0	667.1	672.3	672.1	669.5	641.7	653.5	655.9	659.1	682.1	688.3	689.7	691.8	673.0	681.1	683.9	684.9	686.3	691.8	696.7	697.9
other	42.5	42.6	42.6	42.6	42.5	42.4	42.5	42.3	42.3	42.7	42.8	42.8	42.8	42.8	42.9	42.9	42.9	41.5	41.6	41.5	41.5
PRIMARY ENERGY (quadrillion Btu)																					
Consumption	100.5	100.9	100.9	101.0	100.6	101.3	101.5	101.5	101.5	100.1	100.2	100.2	100.2	103.0	103.3	103.3	103.3	99.2	99.6	99.5	99.6
liquids	36.7	36.7	36.7	36.7	36.7	37.0	37.0	37.0	37.0	36.6	36.6	36.6	36.6	37.5	37.6	37.6	37.6	36.5	36.5	36.5	36.6
natural gas	27.6	27.6	27.5	27.5	27.6	29.6	29.4	29.4	29.2	26.3	26.0	25.9	25.9	28.6	28.5	28.5	28.5	28.9	29.1	29.0	29.0
coal	18.6	18.9	18.9	19.0	18.7	17.2	17.4	17.5	17.6	19.3	19.6	19.6	19.6	19.0	19.3	19.3	19.3	16.0	16.0	16.0	16.0
other	17.7	17.7	17.7	17.7	17.7	17.4	17.6	17.6	17.6	17.9	18.0	18.1	18.1	17.8	17.9	17.9	18.0	17.9	17.9	18.0	18.0
Production	93.3	95.3	96.0	96.4	94.2	98.9	100.1	100.7	101.0	90.6	92.8	93.4	93.7	95.0	97.0	97.6	97.9	92.0	94.3	94.7	95.2
ENERGY RELATED CO2 EMISSIONS (including liquefaction) (million metric tons)	5,469	5,497	5,501	5,508	5,477	5,464	5,477	5,483	5,485	5,462	5,477	5,474	5,473	5,614	5,634	5,635	5,634	5,276	5,290	5,285	5,289
ECONOMIC INDICATORS																					
Gross Domestic Product (B 2005 chain-weighted $)	16,739	16,751	16,754	16,756	16,742	16,831	16,839	16,842	16,844	16,699	16,705	16,707	16,709	17,517	17,528	17,529	17,532	16,708	16,720	16,721	16,726
Total industrial shipments (B 2005$)	7,960	7,971	7,972	7,969	7,961	8,117	8,118	8,117	8,117	7,900	7,891	7,889	7,889	8,557	8,564	8,560	8,561	7,926	7,937	7,930	7,946
Non-farm employment (millions)	148	148	148	148	148	148	148	148	148	147	147	147	147	152	152	152	152	147	147	147	148
Annual change in Consumer Price Index	1.8%	1.8%	1.9%	1.9%	1.9%	1.8%	1.8%	1.8%	1.8%	1.9%	2.0%	2.0%	2.0%	1.5%	1.5%	1.5%	1.5%	1.8%	1.8%	1.9%	1.9%

Table B5. Differential from Base in U.S. Annual Average Values from 2015-25 when Exports are Added

	Reference					High Oil and Gas Resource				Low Oil and Gas Resource				High Macroeconomic Growth				Accelerated Coal and Nuclear Retirements			
	baseline	12 Bcf	16 Bcf	20 Bcf	Alt 20 Bcf	baseline	12 Bcf	16 Bcf	20 Bcf	baseline	12 Bcf	16 Bcf	20 Bcf	baseline	12 Bcf	16 Bcf	20 Bcf	baseline	12 Bcf	16 Bcf	20 Bcf
NATURAL GAS VOLUMES (Tcf)																					
Net Exports		1.6	2.1	2.4	0.8		1.0	1.5	1.9		2.1	2.7	3.0		1.6	2.1	2.5		1.7	2.2	2.6
gross imports		0.1	0.1	0.1	0.0		0.1	0.1	0.1		0.2	0.2	0.2		0.1	0.1	0.2		0.1	0.1	0.1
gross exports		1.7	2.3	2.6	0.8		1.1	1.7	2.0		2.3	2.9	3.2		1.7	2.3	2.6		1.8	2.3	2.7
Dry Production		1.5	2.0	2.3	0.7		0.8	1.3	1.5		1.8	2.3	2.6		1.5	2.1	2.3		1.9	2.3	2.7
shale gas		1.2	1.5	1.7	0.5		0.7	1.0	1.0		1.4	1.8	1.9		1.2	1.6	1.8		1.6	1.8	2.1
other		0.4	0.5	0.6	0.2		0.2	0.4	0.5		0.4	0.5	0.6		0.4	0.5	0.6		0.3	0.6	0.6
Consumed Volumes (1)		(0.0)	(0.1)	(0.2)	(0.1)		(0.1)	(0.2)	(0.3)		(0.3)	(0.4)	(0.4)		(0.1)	(0.1)	(0.1)		0.2	0.1	0.2
electric generators		(0.2)	(0.4)	(0.4)	(0.2)		(0.3)	(0.3)	(0.5)		(0.4)	(0.5)	(0.6)		(0.2)	(0.3)	(0.4)		(0.1)	(0.1)	(0.2)
industrial		(0.0)	(0.0)	(0.1)	(0.0)		(0.0)	(0.1)	(0.1)		(0.1)	(0.2)	(0.2)		(0.0)	(0.1)	(0.1)		(0.0)	(0.1)	(0.0)
liquefaction		0.2	0.2	0.3	0.1		0.1	0.2	0.2		0.2	0.3	0.3		0.2	0.2	0.3		0.2	0.2	0.3
residential		(0.0)	(0.0)	(0.0)	(0.0)		(0.0)	(0.0)	(0.0)		(0.0)	(0.1)	(0.1)		(0.0)	(0.0)	(0.0)		(0.0)	(0.0)	(0.0)
commercial		(0.0)	(0.0)	(0.0)	(0.0)		(0.0)	(0.0)	(0.0)		(0.1)	(0.1)	(0.1)		(0.0)	(0.0)	(0.0)		(0.0)	(0.0)	(0.0)
other		0.1	0.1	0.1	0.0		0.0	0.1	0.1		0.1	0.1	0.2		0.1	0.1	0.1		0.1	0.2	0.2
NATURAL GAS END-USE PRICES (2012$/Mcf)																					
residential		0.2	0.3	0.4	0.2		0.2	0.3	0.4		0.9	1.1	1.3		0.3	0.5	0.6		0.2	0.4	0.4
commercial		0.2	0.3	0.4	0.2		0.1	0.2	0.3		0.8	1.1	1.2		0.3	0.5	0.6		0.2	0.4	0.4
industrial		0.2	0.3	0.4	0.2		0.1	0.3	0.4		0.8	1.1	1.3		0.3	0.5	0.6		0.2	0.4	0.4
OTHER PRICES																					
Natural Gas Lower 48 Supply Price (2012$/Mcf)		0.2	0.3	0.4	0.2		0.1	0.2	0.3		0.8	1.0	1.2		0.3	0.4	0.5		0.1	0.3	0.4
Northeast (2012$/Mcf)		0.2	0.2	0.2	0.2		(0.1)	(0.2)	(0.2)		0.7	0.8	0.9		0.2	0.3	0.4		0.2	0.3	0.2
Gulf Coast (2012$/Mcf)		0.2	0.3	0.5	0.2		0.1	0.3	0.5		0.8	1.0	1.3		0.2	0.4	0.6		0.2	0.4	0.5
West Coast (2012$/Mcf)		0.1	0.2	0.3	0.1		0.2	0.4	0.4		0.8	1.1	1.2		0.3	0.5	0.6		0.1	0.3	0.3
Coal Minemouth Price (2012$/short-ton)		0.1	0.1	0.1	0.0		(0.0)	0.0	(0.0)		0.2	0.2	0.2		0.1	0.2	0.2		0.2	0.1	0.1
End-Use Electricity Price (2012 cents/Kwh)		0.1	0.1	0.1	0.1		0.0	0.1	0.1		0.3	0.4	0.4		0.1	0.2	0.2		0.1	0.1	0.2
END-USE ENERGY EXPENDITURES (B 2012$)		6.3	9.9	12.3	4.9		4.6	8.1	11.7		20.1	25.6	30.6		8.6	14.2	16.5		5.6	9.2	13.9
liquids		2.0	2.7	2.8	0.8		2.5	3.1	4.7		2.4	2.8	3.2		1.9	2.6	3.0		0.8	0.6	2.8
natural gas		2.3	3.8	5.1	2.3		1.3	2.9	4.1		9.3	11.8	14.2		3.5	5.7	7.0		1.8	4.3	4.7
electricity		2.0	3.4	4.4	1.9		0.8	2.2	2.9		8.4	11.0	13.2		3.2	5.9	6.6		2.9	4.3	6.4
coal		0.0	0.0	0.0	0.0		0.0	0.0	0.0		(0.0)	(0.0)	(0.0)		0.0	0.0	0.0		(0.0)	(0.0)	(0.0)
END-USE ENERGY CONSUMPTION (quadrillion Btu)		(0.0)	(0.1)	(0.1)	(0.3)		(0.1)	(0.1)	(0.1)		(0.3)	(0.4)	(0.4)		(0.1)	(0.2)	(0.2)		(0.0)	(0.2)	(0.0)
ELECTRIC GENERATION (billion kWh)		(4.3)	(8.2)	(10.0)	(3.8)		(4.5)	(8.0)	(10.3)		(27.8)	(35.4)	(40.0)		(7.0)	(13.1)	(16.1)		(2.2)	(10.3)	(18.0)
coal		28.3	34.3	44.9	11.6		20.6	29.0	36.6		28.3	28.2	29.5		21.5	22.9	25.0		0.7	0.7	0.7
gas		(35.8)	(50.8)	(63.2)	(20.9)		(37.0)	(51.2)	(64.3)		(62.6)	(74.7)	(83.0)		(36.7)	(46.7)	(56.0)		(8.4)	(21.4)	(30.2)
nuclear		0.0	0.0	0.0	0.1		(0.0)	(0.0)	(0.0)		0.2	3.5	3.7		(0.0)	(0.2)	2.9		0.0	0.0	0.0
renewables		3.0	8.2	8.1	5.4		11.8	14.3	17.4		6.2	7.6	9.7		8.1	10.9	11.9		5.5	10.4	11.6
other		0.1	0.1	0.1	0.0		0.1	(0.1)	(0.1)		0.1	0.1	0.1		0.1	0.1	0.1		0.0	(0.0)	0.0
PRIMARY ENERGY (quadrillion Btu)																					
Consumption		0.3	0.4	0.4	0.1		0.2	0.3	0.2		0.1	0.1	0.1		0.3	0.3	0.3		0.3	0.3	0.4
liquids		0.1	0.1	0.1	0.0		0.0	0.0	0.0		0.0	0.0	0.0		0.0	0.0	0.0		0.1	0.0	0.1
natural gas		(0.0)	(0.1)	(0.2)	(0.1)		(0.2)	(0.2)	(0.3)		(0.3)	(0.4)	(0.4)		(0.1)	(0.1)	(0.1)		0.2	0.1	0.2
coal		0.3	0.4	0.5	0.1		0.2	0.3	0.4		0.3	0.3	0.3		0.2	0.2	0.3		0.0	0.0	0.0
other		0.0	0.1	0.1	0.1		0.1	0.1	0.2		0.1	0.1	0.1		0.1	0.1	0.1		0.1	0.1	0.1
Production		2.0	2.7	3.0	0.9		1.2	1.8	2.1		2.3	2.8	3.1		2.0	2.6	2.9		2.3	2.7	3.2
ENERGY RELATED CO2 EMISSIONS (including liquefaction) (million metric tons)		29	32	40	8		14	20	21		15	12	11		20	21	20		14	9	12
ECONOMIC INDICATORS																					
Gross Domestic Product (B 2005 chain-weighted $)		12	15	17	3		7	10	13		6	8	10		11	12	14		12	13	17
Total industrial shipments (B 2005$)		11	11	9	0		1	0	(0)		(9)	(11)	(11)		7	3	4		11	4	20
Non-farm employment (millions)		0	0	0	0		0	0	0		0	0	0		0	0	0		0	0	0
Annual change in Consumer Price Index		0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%		0.1%	0.1%	0.1%		0.0%	0.0%	0.0%		0.0%	0.0%	0.0%

Table B6. Differential (%) from Base in U.S. Annual Average Values from 2015-25 when Exports are Added

	Reference					High Oil and Gas Resource				Low Oil and Gas Resource				High Macroeconomic Growth				Accelerated Coal and Nuclear Retirements			
	baseline	12 Bcf	16 Bcf	20 Bcf	Alt 20 Bcf	baseline	12 Bcf	16 Bcf	20 Bcf	baseline	12 Bcf	16 Bcf	20 Bcf	baseline	12 Bcf	16 Bcf	20 Bcf	baseline	12 Bcf	16 Bcf	20 Bcf
NATURAL GAS VOLUMES (Tcf)																					
Net Exports		105.7%	144.2%	165.2%	51.1%		52.0%	81.1%	97.6%		321.7%	407.6%	453.6%		113.0%	152.0%	174.5%		123.8%	164.0%	189.7%
gross imports		4.7%	5.0%	5.1%	1.6%		4.9%	5.4%	5.6%		7.9%	8.6%	9.2%		4.9%	5.6%	6.1%		3.8%	4.6%	4.5%
gross exports		42.6%	57.2%	65.2%	20.2%		24.9%	37.6%	44.7%		70.2%	87.8%	97.4%		44.1%	58.7%	67.1%		45.7%	60.3%	69.2%
Dry Production		5.3%	7.1%	8.0%	2.3%		2.7%	4.3%	5.0%		6.8%	8.7%	9.6%		5.2%	7.0%	7.9%		6.3%	7.9%	9.1%
shale gas		8.9%	11.5%	12.8%	3.8%		4.5%	6.7%	7.1%		12.3%	15.5%	17.1%		8.5%	11.5%	12.8%		11.3%	12.9%	15.5%
other		2.4%	3.4%	3.9%	1.1%		1.1%	2.2%	3.1%		2.7%	3.6%	4.1%		2.3%	3.1%	3.6%		1.9%	3.5%	3.5%
Consumed Volumes (1)		-0.2%	-0.4%	-0.6%	-0.3%		-0.5%	-0.7%	-1.1%		-1.2%	-1.4%	-1.6%		-0.2%	-0.3%	-0.5%		0.7%	0.5%	0.5%
electric generators		-2.8%	-4.0%	-5.0%	-1.8%		-2.5%	-3.4%	-4.6%		-5.3%	-6.4%	-7.2%		-2.7%	-3.3%	-4.1%		-0.6%	-1.3%	-2.0%
industrial		-0.4%	-0.6%	-0.8%	-0.3%		-0.3%	-0.6%	-0.9%		-1.5%	-1.9%	-2.2%		-0.5%	-0.9%	-1.1%		-0.3%	-0.8%	-0.6%
liquefaction		98.2%	133.2%	152.7%	46.6%		49.3%	75.6%	90.3%		221.1%	276.9%	307.9%		103.6%	139.4%	159.2%		108.2%	144.7%	165.0%
residential		-0.3%	-0.5%	-0.6%	-0.2%		-0.3%	-0.4%	-0.5%		-1.1%	-1.3%	-1.4%		-0.4%	-0.7%	-0.7%		-0.2%	-0.5%	-0.5%
commercial		-0.6%	-0.9%	-1.1%	-0.4%		-0.5%	-0.7%	-1.0%		-2.0%	-2.5%	-2.8%		-0.9%	-1.3%	-1.5%		-0.4%	-1.0%	-0.9%
other		4.4%	5.6%	6.1%	1.8%		2.0%	3.1%	3.5%		5.3%	6.5%	7.2%		4.3%	5.4%	6.0%		5.5%	6.3%	7.4%
NATURAL GAS END-USE PRICES (2012$/Mcf)																					
residential		1.8%	2.8%	3.7%	1.7%		1.5%	2.3%	3.5%		6.8%	8.6%	10.1%		2.7%	4.2%	5.0%		1.4%	3.2%	3.2%
commercial		2.1%	3.3%	4.4%	2.0%		1.5%	2.3%	3.6%		8.0%	9.9%	11.7%		3.2%	4.9%	5.8%		1.7%	3.8%	3.8%
industrial		3.2%	5.5%	7.5%	3.1%		2.6%	5.7%	8.0%		12.4%	16.1%	19.4%		4.8%	7.9%	9.9%		2.5%	6.3%	6.9%
OTHER PRICES																					
Natural Gas Lower 48 Supply Price (2012$/Mcf)		3.7%	6.5%	8.9%	4.0%		2.3%	6.0%	9.0%		15.2%	19.9%	24.1%		5.7%	9.6%	12.1%		3.1%	7.6%	8.4%
Northeast (2012$/Mcf)		3.6%	4.5%	5.6%	3.8%		-2.7%	-5.7%	-5.9%		13.9%	14.9%	16.4%		5.7%	8.0%	8.6%		3.9%	6.0%	4.3%
Gulf Coast (2012$/Mcf)		4.2%	7.7%	10.6%	4.5%		2.1%	7.7%	12.3%		15.0%	20.1%	25.1%		5.2%	9.7%	12.8%		4.5%	9.5%	11.5%
West Coast (2012$/Mcf)		3.1%	5.2%	6.6%	2.7%		4.8%	8.6%	10.4%		14.6%	20.7%	23.6%		6.8%	10.1%	12.2%		2.1%	5.9%	6.8%
Coal Minemouth Price (2012$/short-ton)		0.2%	0.2%	0.2%	0.1%		0.0%	0.1%	0.0%		0.5%	0.5%	0.5%		0.3%	0.4%	0.4%		0.3%	0.3%	0.2%
End-Use Electricity Price (2012 cents/Kwh)		0.6%	1.1%	1.4%	0.6%		0.3%	0.7%	1.0%		2.8%	3.6%	4.3%		1.0%	1.9%	2.0%		0.9%	1.4%	1.9%
END-USE ENERGY EXPENDITURES (B 2012$)		0.5%	0.8%	1.0%	0.4%		0.4%	0.7%	0.9%		1.5%	1.9%	2.3%		0.6%	1.1%	1.2%		0.4%	0.7%	1.1%
liquids		0.3%	0.4%	0.4%	0.1%		0.3%	0.4%	0.6%		0.3%	0.3%	0.4%		0.2%	0.3%	0.4%		0.1%	0.1%	0.4%
natural gas		1.9%	3.2%	4.2%	1.9%		1.2%	2.6%	3.7%		7.3%	9.2%	11.1%		2.9%	4.6%	5.7%		1.5%	3.6%	3.9%
electricity		0.5%	0.9%	1.2%	0.5%		0.2%	0.6%	0.8%		2.2%	2.8%	3.4%		0.8%	1.5%	1.7%		0.8%	1.1%	1.6%
coal		0.3%	0.3%	0.3%	0.1%		0.2%	0.2%	0.2%		-0.1%	-0.2%	-0.3%		0.1%	0.0%	0.1%		0.0%	-0.2%	0.0%
END-USE ENERGY CONSUMPTION (quadrillion Btu)		0.0%	-0.1%	-0.2%	-0.5%		-0.1%	-0.2%	-0.2%		-0.5%	-0.6%	-0.6%		-0.1%	-0.2%	-0.3%		0.0%	-0.2%	-0.1%
ELECTRIC GENERATION (billion kWh)		-0.1%	-0.2%	-0.2%	-0.1%		-0.1%	-0.2%	-0.2%		-0.6%	-0.8%	-0.9%		-0.2%	-0.3%	-0.4%		-0.1%	-0.2%	-0.4%
coal		1.7%	2.1%	2.7%	0.7%		1.4%	1.9%	2.4%		1.7%	1.6%	1.7%		1.3%	1.4%	1.5%		0.0%	0.0%	0.0%
gas		-2.8%	-4.0%	-5.0%	-1.6%		-2.5%	-3.5%	-4.4%		-5.5%	-6.5%	-7.2%		-2.7%	-3.4%	-4.1%		-0.6%	-1.5%	-2.1%
nuclear		0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%		0.0%	0.4%	0.5%		0.0%	0.0%	0.4%		0.0%	0.0%	0.0%
renewables		0.5%	1.2%	1.2%	0.8%		1.8%	2.2%	2.7%		0.9%	1.1%	1.4%		1.2%	1.6%	1.8%		0.8%	1.5%	1.7%
other		0.2%	0.3%	0.3%	0.1%		0.2%	-0.3%	-0.2%		0.2%	0.2%	0.2%		0.2%	0.3%	0.2%		0.0%	0.0%	0.0%
PRIMARY ENERGY (quadrillion Btu)																					
Consumption		0.3%	0.4%	0.4%	0.1%		0.2%	0.2%	0.2%		0.1%	0.1%	0.1%		0.3%	0.3%	0.3%		0.3%	0.3%	0.4%
liquids		0.1%	0.2%	0.2%	0.0%		0.0%	0.0%	0.0%		0.1%	0.1%	0.1%		0.1%	0.1%	0.1%		0.2%	0.0%	0.3%
natural gas		-0.2%	-0.4%	-0.6%	-0.3%		-0.5%	-0.7%	-1.1%		-1.2%	-1.4%	-1.6%		-0.2%	-0.3%	-0.5%		0.7%	0.5%	0.5%
coal		1.6%	2.0%	2.6%	0.7%		1.3%	1.8%	2.2%		1.6%	1.6%	1.7%		1.2%	1.3%	1.4%		0.0%	0.0%	0.0%
other		0.2%	0.5%	0.4%	0.3%		0.7%	0.8%	1.0%		0.4%	0.6%	0.8%		0.4%	0.6%	0.8%		0.3%	0.6%	0.6%
Production		2.2%	2.9%	3.2%	1.0%		1.2%	1.8%	2.1%		2.5%	3.1%	3.4%		2.1%	2.7%	3.1%		2.5%	2.9%	3.5%
ENERGY RELATED CO2 EMISSIONS (including liquefaction) (million metric tons)		0.5%	0.6%	0.7%	0.2%		0.3%	0.4%	0.4%		0.3%	0.2%	0.2%		0.4%	0.4%	0.4%		0.3%	0.2%	0.2%
ECONOMIC INDICATORS																					
Gross Domestic Product (B 2005 chain-weighted $)		0.1%	0.1%	0.1%	0.0%		0.0%	0.1%	0.1%		0.0%	0.1%	0.1%		0.1%	0.1%	0.1%		0.1%	0.1%	0.1%
Total industrial shipments (B 2005$)		0.1%	0.1%	0.1%	0.0%		0.0%	0.0%	0.0%		-0.1%	-0.1%	-0.1%		0.1%	0.0%	0.0%		0.1%	0.1%	0.3%
Non-farm employment (millions)		0.1%	0.1%	0.1%	0.0%		0.0%	0.1%	0.1%		0.0%	0.1%	0.1%		0.1%	0.1%	0.1%		0.1%	0.1%	0.1%
Annual change in Consumer Price Index		-0.2%	0.4%	1.3%	1.2%		0.3%	0.2%	1.4%		2.6%	3.6%	4.9%		0.0%	1.1%	1.8%		-0.4%	0.2%	0.6%

Table B7. U.S. Annual Averages Values from 2026-40

	Reference					High Oil and Gas Resource				Low Oil and Gas Resource				High Macroeconomic Growth				Accelerated Coal and Nuclear Retirements			
	baseline	12 Bcf	16 Bcf	20 Bcf	Alt 20 Bcf	baseline	12 Bcf	16 Bcf	20 Bcf	baseline	12 Bcf	16 Bcf	20 Bcf	baseline	12 Bcf	16 Bcf	20 Bcf	baseline	12 Bcf	16 Bcf	20 Bcf
NATURAL GAS VOLUMES (Tcf)																					
Net Exports	5.1	6.6	8.0	9.3	9.3	7.2	6.4	7.7	9.1	2.6	5.1	6.3	7.4	4.7	6.5	7.9	9.2	4.6	6.5	7.8	9.2
gross imports	2.0	2.2	2.1	2.1	2.1	2.2	2.3	2.1	2.1	2.7	3.0	3.1	3.2	2.1	2.2	2.2	2.2	2.1	2.2	2.2	2.2
gross exports	7.1	8.8	10.1	11.4	11.4	9.4	8.7	9.9	11.2	5.3	8.1	9.4	10.6	6.8	8.8	10.0	11.4	6.7	8.7	10.0	11.4
Dry Production	35.3	36.7	37.9	39.1	39.3	40.8	40.0	41.4	42.7	28.7	30.7	31.7	32.6	36.9	38.5	39.7	40.9	37.0	38.8	40.0	41.4
shale gas	18.0	19.0	19.9	20.9	20.8	23.3	22.9	22.7	23.4	12.6	13.9	14.6	15.2	19.1	20.3	21.2	22.0	19.2	20.4	21.4	22.2
other	17.3	17.6	17.9	18.3	18.5	17.5	17.1	18.7	19.3	16.2	16.8	17.1	17.4	17.8	18.2	18.5	18.9	17.9	18.4	18.6	19.2
Consumed Volumes (1)	30.0	29.9	29.8	29.7	29.8	33.5	33.4	33.5	33.5	26.0	25.5	25.3	25.2	32.1	31.8	31.7	31.6	32.3	32.2	32.1	32.1
electric generators	10.4	10.1	9.9	9.7	9.8	12.8	12.9	12.8	12.6	7.8	7.2	6.9	6.6	11.4	11.0	10.7	10.4	12.8	12.4	12.2	12.1
industrial	8.6	8.5	8.5	8.5	8.5	8.9	8.9	8.8	8.8	8.2	8.0	8.0	8.0	9.2	9.1	9.1	9.1	8.5	8.5	8.4	8.4
liquefaction	0.3	0.5	0.7	0.8	0.8	0.5	0.4	0.6	0.7	0.2	0.5	0.7	0.8	0.3	0.5	0.7	0.8	0.3	0.5	0.7	0.8
residential	4.3	4.2	4.2	4.2	4.2	4.4	4.4	4.4	4.4	4.1	4.1	4.1	4.1	4.5	4.5	4.5	4.5	4.3	4.2	4.2	4.2
commercial	3.4	3.3	3.3	3.3	3.3	3.5	3.5	3.5	3.5	3.2	3.1	3.1	3.1	3.4	3.4	3.4	3.4	3.4	3.3	3.3	3.3
other	3.1	3.1	3.2	3.2	3.2	3.4	3.3	3.4	3.5	2.5	2.6	2.6	2.7	3.3	3.3	3.4	3.4	3.1	3.2	3.2	3.3
NATURAL GAS END-USE PRICES (2012$/Mcf)																					
residential	14.5	14.8	15.0	15.3	15.2	12.7	12.7	12.7	12.8	17.1	17.9	18.3	18.5	15.1	15.4	15.6	15.8	14.8	15.2	15.4	15.7
commercial	11.9	12.2	12.4	12.7	12.6	10.1	10.0	10.1	10.1	14.6	15.4	15.7	16.0	12.3	12.7	12.9	13.1	12.2	12.7	12.9	13.2
industrial	7.6	7.9	8.1	8.3	8.3	5.7	5.6	5.7	5.8	10.0	10.7	11.1	11.4	7.9	8.3	8.4	8.6	8.0	8.4	8.5	8.8
OTHER PRICES																					
Natural Gas Lower 48 Supply Price (2012$/Mcf)	6.2	6.5	6.7	6.9	6.9	4.4	4.3	4.3	4.4	8.6	9.3	9.6	9.9	6.5	6.8	7.0	7.2	6.6	7.0	7.1	7.4
Northeast (2012$/Mcf)	6.6	7.0	7.1	7.4	7.2	5.1	5.0	4.9	4.9	9.9	10.8	11.1	11.1	7.1	7.4	7.6	7.8	7.1	7.6	7.8	8.2
Gulf Coast (2012$/Mcf)	6.3	6.5	6.7	6.9	6.9	4.2	4.1	4.2	4.3	8.5	9.2	9.6	9.9	6.6	6.9	7.0	7.2	6.6	7.0	7.1	7.3
West Coast (2012$/Mcf)	6.3	6.7	6.8	7.0	7.0	4.6	4.6	4.6	4.7	8.4	8.9	9.2	9.5	6.6	6.9	7.1	7.2	6.7	7.2	7.3	7.4
Coal Minemouth Price (2012$/short-ton)	54.8	54.9	54.9	54.8	54.9	53.9	53.9	54.0	53.9	55.1	55.0	55.0	55.0	55.7	55.7	55.7	55.7	90.2	90.2	90.3	90.3
End-Use Electricity Price (2012 cents/Kwh)	10.6	10.8	10.8	10.9	10.9	9.8	9.8	9.8	9.8	11.6	11.9	12.0	12.1	10.9	11.0	11.1	11.2	11.6	11.8	11.9	11.9
END-USE ENERGY EXPENDITURES (B 2012$)	1,496.6	1,507.9	1,513.2	1,519.6	1,517.7	1,393.3	1,392.4	1,391.5	1,392.6	1,562.0	1,578.9	1,585.5	1,591.4	1,629.5	1,642.2	1,648.7	1,655.1	1,520.5	1,535.0	1,537.4	1,547.1
liquids	889.5	893.0	893.8	894.6	893.5	834.3	834.4	834.0	832.8	899.9	902.2	902.9	903.9	962.1	966.7	967.3	969.6	880.2	883.6	881.7	885.8
natural gas	155.9	158.8	160.9	163.3	163.1	131.9	131.0	130.8	132.0	181.7	188.6	191.6	194.4	171.9	175.4	177.4	179.5	159.2	163.7	165.3	168.3
electricity	442.7	447.4	449.8	453.1	452.5	418.6	418.5	418.1	419.2	471.8	479.5	482.5	484.7	485.2	489.8	493.5	495.7	469.5	476.1	478.7	481.3
coal	8.6	8.7	8.7	8.7	8.6	8.5	8.5	8.5	8.5	8.6	8.5	8.5	8.5	10.3	10.4	10.3	10.4	11.7	11.7	11.7	11.7
END-USE ENERGY CONSUMPTION (quadrillion Btu)	66.0	65.9	65.8	65.7	65.6	68.3	68.2	68.1	68.0	64.3	64.0	63.9	63.8	70.2	70.1	70.0	69.9	65.1	65.1	64.8	64.9
ELECTRIC GENERATION (billion kWh)	4,933.7	4,922.8	4,912.1	4,904.0	4,901.6	5,071.8	5,079.6	5,070.2	5,065.6	4,790.9	4,756.4	4,744.4	4,733.5	5,284.0	5,272.0	5,261.3	5,251.9	4,822.4	4,804.0	4,794.1	4,786.1
coal	1,686.4	1,703.5	1,708.3	1,718.9	1,699.4	1,533.9	1,531.9	1,535.7	1,548.5	1,756.0	1,777.2	1,772.9	1,775.4	1,736.7	1,745.3	1,747.7	1,750.6	1,250.0	1,250.9	1,250.9	1,250.9
gas	1,641.4	1,595.8	1,561.0	1,530.5	1,549.7	1,986.9	1,987.6	1,973.1	1,950.1	1,240.1	1,136.1	1,090.9	1,047.7	1,813.3	1,749.8	1,709.0	1,664.6	2,021.1	1,974.6	1,942.5	1,915.1
nuclear	787.3	793.6	804.3	809.6	807.4	779.3	779.3	779.3	779.3	871.1	891.5	938.3	942.9	827.5	843.3	857.4	884.3	676.9	694.6	702.3	708.9
renewables	776.2	787.4	796.0	802.5	802.7	729.7	738.9	740.3	745.8	881.2	909.0	899.7	925.0	863.5	890.6	904.2	909.4	833.7	843.2	857.8	870.5
other	42.4	42.5	42.5	42.5	42.4	41.9	41.8	41.8	41.9	42.5	42.6	42.5	42.5	43.1	43.1	43.1	43.1	40.7	40.7	40.7	40.7
PRIMARY ENERGY (quadrillion Btu)																					
Consumption	104.1	104.4	104.5	104.7	104.6	101.3	101.5	101.5	101.5	100.1	100.2	100.2	100.2	103.0	103.3	103.3	103.3	99.2	99.6	99.5	99.6
liquids	35.6	35.7	35.7	35.7	35.7	37.0	37.0	37.0	37.0	36.6	36.6	36.6	36.6	37.5	37.6	37.6	37.6	36.5	36.5	36.5	36.6
natural gas	30.7	30.5	30.4	30.3	30.5	29.6	29.4	29.4	29.2	26.3	26.0	25.9	25.9	28.6	28.5	28.5	28.5	28.9	29.1	29.0	29.0
coal	18.9	19.1	19.2	19.3	19.1	17.2	17.4	17.5	17.6	19.3	19.6	19.6	19.6	19.0	19.3	19.3	19.3	16.0	16.0	16.0	16.0
other	18.9	19.1	19.3	19.4	19.4	17.4	17.6	17.6	17.6	17.9	18.0	18.1	18.1	17.8	17.9	17.9	18.0	17.9	17.9	18.0	18.0
Production	99.9	101.8	103.4	104.9	104.8	98.9	100.1	100.7	101.0	90.6	92.8	93.4	93.7	95.0	97.0	97.6	97.9	92.0	94.3	94.7	95.2
ENERGY RELATED CO2 EMISSIONS (including liquefaction) (million metric tons)	5,547	5,562	5,562	5,571	5,556	5,464	5,477	5,483	5,485	5,462	5,477	5,474	5,473	5,614	5,634	5,635	5,634	5,276	5,290	5,285	5,289
ECONOMIC INDICATORS																					
Gross Domestic Product (B 2005 chain-weighted $)	22,778	22,792	22,806	22,820	22,815	22,993	22,990	23,003	23,016	22,670	22,694	22,704	22,711	24,674	24,690	24,707	24,722	22,696	22,713	22,730	22,742
Total industrial shipments (B 2005$)	9,967	9,984	9,989	9,991	9,979	10,339	10,342	10,338	10,334	9,749	9,754	9,753	9,749	11,388	11,406	11,409	11,417	9,896	9,921	9,918	9,931
Non-farm employment (millions)	162	162	162	162	162	162	162	162	163	161	161	161	161	170	170	170	170	161	161	162	162
Annual change in Consumer Price Index	2.3%	2.3%	2.3%	2.3%	2.3%	2.2%	2.2%	2.2%	2.1%	2.3%	2.3%	2.3%	2.3%	2.0%	2.0%	2.0%	2.0%	2.3%	2.3%	2.3%	2.3%

Table B8. Differential from Base in U.S. Annual Average Values from 2026-40 when Exports are Added

	Reference					High Oil and Gas Resource				Low Oil and Gas Resource				High Macroeconomic Growth				Accelerated Coal and Nuclear Retirements			
	baseline	12 Bcf	16 Bcf	20 Bcf	Alt 20 Bcf	baseline	12 Bcf	16 Bcf	20 Bcf	baseline	12 Bcf	16 Bcf	20 Bcf	baseline	12 Bcf	16 Bcf	20 Bcf	baseline	12 Bcf	16 Bcf	20 Bcf
NATURAL GAS VOLUMES (Tcf)																					
Net Exports		1.5	2.8	4.2	4.2		(0.8)	0.6	1.9		2.4	3.6	4.7		1.8	3.2	4.6		1.9	3.2	4.6
gross imports		0.2	0.1	0.1	0.1		0.1	(0.1)	(0.1)		0.4	0.4	0.6		0.1	0.1	0.1		0.1	0.1	0.1
gross exports		1.7	3.0	4.3	4.3		(0.7)	0.5	1.8		2.8	4.1	5.3		2.0	3.3	4.6		2.0	3.3	4.7
Dry Production		1.4	2.6	3.9	4.0		(0.8)	0.6	1.9		1.9	3.0	3.9		1.6	2.8	4.0		1.7	3.0	4.3
shale gas		1.1	2.0	2.9	2.9		(0.4)	(0.6)	0.1		1.3	2.0	2.6		1.2	2.1	3.0		1.2	2.2	3.1
other		0.3	0.6	0.9	1.1		(0.5)	1.2	1.8		0.6	1.0	1.3		0.4	0.7	1.1		0.5	0.8	1.3
Consumed Volumes (1)		(0.1)	(0.3)	(0.3)	(0.2)		(0.1)	0.0	(0.0)		(0.5)	(0.7)	(0.8)		(0.2)	(0.4)	(0.5)		(0.1)	(0.2)	(0.2)
electric generators		(0.3)	(0.5)	(0.7)	(0.6)		0.1	0.0	(0.2)		(0.6)	(0.9)	(1.2)		(0.4)	(0.7)	(1.0)		(0.3)	(0.5)	(0.7)
industrial		(0.0)	(0.1)	(0.1)	(0.1)		(0.0)	(0.1)	(0.1)		(0.1)	(0.2)	(0.2)		(0.1)	(0.1)	(0.1)		(0.0)	(0.1)	(0.1)
liquefaction		0.2	0.3	0.5	0.5		(0.1)	0.1	0.2		0.3	0.5	0.6		0.2	0.4	0.5		0.2	0.4	0.5
residential		(0.0)	(0.0)	(0.0)	(0.0)		(0.0)	(0.0)	(0.0)		(0.0)	(0.1)	(0.1)		(0.0)	(0.0)	(0.0)		(0.0)	(0.0)	(0.0)
commercial		(0.0)	(0.0)	(0.1)	(0.1)		0.0	(0.0)	(0.0)		(0.1)	(0.1)	(0.1)		(0.0)	(0.0)	(0.1)		(0.0)	(0.0)	(0.1)
other		0.1	0.1	0.1	0.2		(0.1)	(0.0)	0.1		0.1	0.1	0.2		0.1	0.1	0.2		0.1	0.1	0.2
NATURAL GAS END-USE PRICES (2012$/Mcf)																					
residential		0.3	0.5	0.8	0.8		0.0	0.1	0.1		0.8	1.1	1.4		0.4	0.6	0.8		0.5	0.7	1.0
commercial		0.3	0.5	0.8	0.7		(0.0)	(0.0)	0.1		0.8	1.1	1.4		0.3	0.5	0.8		0.4	0.7	0.9
industrial		0.3	0.5	0.7	0.7		(0.0)	(0.0)	0.1		0.7	1.0	1.3		0.3	0.5	0.7		0.4	0.6	0.8
OTHER PRICES																					
Natural Gas Lower 48 Supply Price (2012$/Mcf)		0.3	0.5	0.7	0.7		(0.1)	(0.1)	(0.0)		0.7	1.0	1.3		0.3	0.5	0.6		0.4	0.6	0.8
Northeast (2012$/Mcf)		0.3	0.5	0.7	0.6		(0.2)	(0.3)	(0.2)		0.9	1.1	1.2		0.3	0.5	0.7		0.5	0.7	1.1
Gulf Coast (2012$/Mcf)		0.2	0.4	0.6	0.7		(0.0)	0.0	0.1		0.7	1.1	1.4		0.3	0.5	0.6		0.3	0.5	0.7
West Coast (2012$/Mcf)		0.4	0.5	0.7	0.7		0.0	0.1	0.2		0.5	0.9	1.1		0.3	0.5	0.6		0.5	0.6	0.7
Coal Minemouth Price (2012$/short-ton)		0.1	0.1	0.0	0.1		(0.1)	0.0	0.0		(0.1)	(0.0)	(0.1)		0.0	0.0	0.1		0.1	0.1	0.1
End-Use Electricity Price (2012 cents/Kwh)		0.1	0.2	0.3	0.3		(0.0)	(0.0)	0.0		0.3	0.4	0.4		0.1	0.2	0.3		0.2	0.3	0.4
END-USE ENERGY EXPENDITURES (B 2012$)		11.3	16.6	23.0	21.1		(0.9)	(1.8)	(0.7)		16.8	23.4	29.4		12.7	19.1	25.6		14.5	16.9	26.6
liquids		3.5	4.3	5.1	4.0		0.1	(0.4)	(1.5)		2.3	2.9	3.9		4.7	5.3	7.5		3.4	1.5	5.6
natural gas		3.0	5.0	7.4	7.2		(0.9)	(1.0)	0.1		6.9	9.9	12.6		3.4	5.5	7.6		4.5	6.1	9.2
electricity		4.7	7.2	10.4	9.8		(0.1)	(0.4)	0.7		7.7	10.7	12.9		4.6	8.3	10.5		6.6	9.2	11.8
coal		0.0	0.0	0.0	0.0		0.0	0.0	0.0		(0.0)	(0.0)	(0.1)		0.0	0.0	0.0		0.0	0.0	0.0
END-USE ENERGY CONSUMPTION (quadrillion Btu)		(0.1)	(0.1)	(0.2)	(0.4)		(0.1)	(0.2)	(0.3)		(0.3)	(0.4)	(0.5)		(0.1)	(0.2)	(0.2)		(0.0)	(0.3)	(0.2)
ELECTRIC GENERATION (billion kWh)		(10.9)	(21.6)	(29.7)	(32.1)		7.8	(1.6)	(6.2)		(34.5)	(46.6)	(57.5)		(12.0)	(22.7)	(32.1)		(18.4)	(28.4)	(36.4)
coal		17.1	21.9	32.5	13.0		(1.9)	1.8	14.6		21.2	16.9	19.3		8.6	11.1	13.9		0.9	0.9	0.9
gas		(45.5)	(80.4)	(110.9)	(91.7)		0.7	(13.8)	(36.8)		(104.0)	(149.2)	(192.3)		(63.5)	(104.4)	(148.8)		(46.5)	(78.6)	(106.0)
nuclear		6.3	17.0	22.3	20.1		(0.0)	0.0	0.0		20.5	67.2	71.8		15.8	29.9	56.8		17.7	25.3	32.0
renewables		11.1	19.8	26.3	26.5		9.1	10.6	16.0		27.8	18.4	43.8		27.2	40.7	46.0		9.4	24.0	36.8
other		0.1	0.1	0.1	0.0		(0.1)	(0.1)	0.0		0.0	(0.0)	(0.0)		0.0	0.0	0.0		(0.0)	(0.0)	(0.0)
PRIMARY ENERGY (quadrillion Btu)																					
Consumption		0.3	0.5	0.7	0.5		0.2	0.3	0.2		0.1	0.1	0.1		0.3	0.3	0.3		0.3	0.3	0.4
liquids		0.1	0.1	0.2	0.1		0.0	0.0	0.0		0.0	0.0	0.0		0.0	0.0	0.0		0.1	0.0	0.1
natural gas		(0.1)	(0.3)	(0.3)	(0.2)		(0.2)	(0.2)	(0.3)		(0.3)	(0.4)	(0.4)		(0.1)	(0.1)	(0.1)		0.2	0.1	0.2
coal		0.2	0.2	0.3	0.1		0.2	0.3	0.4		0.3	0.3	0.3		0.2	0.2	0.3		0.0	0.0	0.0
other		0.2	0.4	0.5	0.5		0.1	0.1	0.2		0.1	0.1	0.1		0.1	0.1	0.1		0.1	0.1	0.1
Production		1.9	3.4	5.0	4.9		1.2	1.8	2.1		2.3	2.8	3.1		2.0	2.6	2.9		2.3	2.7	3.2
ENERGY RELATED CO2 EMISSIONS (including liquefaction) (million metric tons)		15	15	24	9		14	20	21		15	12	11		20	21	20		14	9	12
ECONOMIC INDICATORS																					
Gross Domestic Product (B 2005 chain-weighted $)		15	29	42	38		(3)	10	23		24	34	42		16	32	48		17	34	47
Total industrial shipments (B 2005$)		17	22	24	12		3	(1)	(5)		5	4	0		18	22	29		24	21	35
Non-farm employment (millions)		0	0	0	0		(0)	0	0		0	0	0		0	0	0		0	0	0
Annual change in Consumer Price Index		0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%		0.0%	0.0%	-0.1%		0.0%	0.0%	0.0%		0.0%	0.0%	0.0%

Table B9. Differential (%) from Base in U.S. Annual Average Values from 2026-40 when Exports are Added

	Reference					High Oil and Gas Resource				Low Oil and Gas Resource				High Macroeconomic Growth				Accelerated Coal and Nuclear Retirements			
	baseline	12 Bcf	16 Bcf	20 Bcf	Alt 20 Bcf	baseline	12 Bcf	16 Bcf	20 Bcf	baseline	12 Bcf	16 Bcf	20 Bcf	baseline	12 Bcf	16 Bcf	20 Bcf	baseline	12 Bcf	16 Bcf	20 Bcf
NATURAL GAS VOLUMES (Tcf)																					
Net Exports		29.1%	55.4%	81.5%	81.6%		-10.7%	8.2%	26.9%		91.6%	138.2%	179.7%		39.5%	67.9%	97.3%		40.3%	69.0%	98.8%
gross imports		9.3%	7.6%	5.6%	6.4%		3.2%	-4.4%	-6.3%		14.3%	15.7%	22.3%		6.8%	3.5%	3.9%		6.2%	5.0%	4.9%
gross exports		23.6%	42.1%	60.5%	60.8%		-7.4%	5.2%	19.1%		52.8%	76.7%	100.7%		29.4%	48.1%	68.5%		29.8%	49.3%	69.8%
Dry Production		3.9%	7.4%	10.9%	11.3%		-2.1%	1.4%	4.6%		6.8%	10.4%	13.6%		4.4%	7.6%	10.9%		4.7%	8.1%	11.7%
shale gas		5.9%	11.0%	16.3%	15.9%		-1.7%	-2.6%	0.5%		10.5%	16.0%	20.8%		6.5%	11.0%	15.6%		6.2%	11.6%	15.9%
other		1.8%	3.5%	5.4%	6.6%		-2.6%	6.8%	10.1%		3.8%	6.0%	7.9%		2.1%	3.9%	5.9%		3.0%	4.2%	7.3%
Consumed Volumes (1)		-0.4%	-0.8%	-1.1%	-0.6%		-0.2%	0.0%	-0.1%		-1.8%	-2.5%	-3.2%		-0.7%	-1.2%	-1.6%		-0.4%	-0.7%	-0.7%
electric generators		-2.6%	-5.0%	-6.8%	-5.8%		0.7%	0.0%	-1.4%		-8.2%	-11.9%	-15.6%		-3.5%	-5.9%	-8.4%		-2.5%	-4.0%	-5.4%
industrial		-0.5%	-0.9%	-1.4%	-1.3%		-0.4%	-0.8%	-1.1%		-1.6%	-2.1%	-2.7%		-0.6%	-1.1%	-1.4%		-0.5%	-1.2%	-1.4%
liquefaction		48.7%	91.3%	133.9%	132.0%		-14.3%	14.3%	42.9%		148.0%	218.0%	288.1%		66.1%	113.3%	160.5%		67.6%	115.2%	162.9%
residential		-0.4%	-0.6%	-0.9%	-0.9%		0.0%	-0.1%	-0.2%		-1.0%	-1.4%	-1.7%		-0.5%	-0.7%	-0.9%		-0.5%	-0.8%	-1.1%
commercial		-0.7%	-1.2%	-1.7%	-1.7%		0.1%	-0.1%	-0.4%		-1.7%	-2.3%	-2.9%		-0.9%	-1.2%	-1.7%		-0.9%	-1.4%	-2.0%
other		1.8%	3.2%	4.6%	5.4%		-2.0%	-0.1%	1.7%		3.6%	5.0%	6.8%		2.0%	3.5%	4.9%		2.4%	4.3%	6.3%
NATURAL GAS END-USE PRICES (2012$/Mcf)																					
residential		2.3%	3.7%	5.4%	5.2%		0.1%	0.5%	1.1%		4.7%	6.7%	8.3%		2.4%	3.8%	5.1%		3.1%	4.5%	6.5%
commercial		2.7%	4.4%	6.4%	6.2%		-0.3%	0.0%	0.7%		5.5%	7.7%	9.4%		2.8%	4.5%	6.1%		3.7%	5.3%	7.7%
industrial		3.9%	6.5%	9.5%	9.3%		-0.9%	-0.3%	1.9%		7.1%	10.3%	13.3%		4.1%	6.4%	8.6%		5.1%	7.2%	10.3%
OTHER PRICES																					
Natural Gas Lower 48 Supply Price (2012$/Mcf)		4.6%	7.9%	11.4%	10.9%		-2.5%	-2.3%	-0.3%		8.3%	11.9%	15.2%		4.6%	7.5%	9.9%		6.0%	8.7%	12.2%
Northeast (2012$/Mcf)		4.8%	7.6%	10.9%	9.0%		-3.3%	-5.0%	-4.5%		8.8%	11.3%	11.8%		4.1%	7.2%	10.5%		6.8%	9.8%	14.8%
Gulf Coast (2012$/Mcf)		3.7%	6.8%	10.2%	10.8%		-0.6%	0.5%	2.9%		8.1%	12.4%	16.3%		4.6%	7.4%	9.3%		5.2%	7.7%	10.7%
West Coast (2012$/Mcf)		5.6%	7.9%	11.4%	11.2%		1.0%	1.7%	3.9%		6.4%	10.3%	13.6%		4.9%	7.0%	8.8%		7.2%	8.8%	10.2%
Coal Minemouth Price (2012$/short-ton)		0.2%	0.2%	0.1%	0.2%		-0.1%	0.1%	0.0%		-0.1%	-0.1%	-0.1%		0.0%	0.0%	0.2%		0.1%	0.1%	0.1%
End-Use Electricity Price (2012 cents/Kwh)		1.3%	2.0%	2.9%	2.8%		-0.1%	-0.2%	0.3%		2.2%	3.0%	3.7%		1.1%	2.2%	2.7%		1.7%	2.5%	3.2%
END-USE ENERGY EXPENDITURES (B 2012$)		0.8%	1.1%	1.5%	1.4%		-0.1%	-0.1%	-0.1%		1.1%	1.5%	1.9%		0.8%	1.2%	1.6%		1.0%	1.1%	1.7%
liquids		0.4%	0.5%	0.6%	0.4%		0.0%	0.0%	-0.2%		0.3%	0.3%	0.4%		0.5%	0.5%	0.8%		0.4%	0.2%	0.6%
natural gas		1.9%	3.2%	4.7%	4.6%		-0.7%	-0.8%	0.1%		3.8%	5.4%	7.0%		2.0%	3.2%	4.4%		2.9%	3.8%	5.8%
electricity		1.1%	1.6%	2.4%	2.2%		0.0%	-0.1%	0.2%		1.6%	2.3%	2.7%		0.9%	1.7%	2.2%		1.4%	2.0%	2.5%
coal		0.5%	0.4%	0.3%	0.0%		0.2%	0.2%	0.1%		-0.4%	-0.5%	-0.7%		0.3%	0.1%	0.2%		0.1%	0.1%	0.0%
END-USE ENERGY CONSUMPTION (quadrillion Btu)		-0.1%	-0.2%	-0.3%	-0.5%		-0.1%	-0.3%	-0.4%		-0.4%	-0.6%	-0.7%		-0.1%	-0.3%	-0.3%		0.0%	-0.4%	-0.4%
ELECTRIC GENERATION (billion kWh)		-0.2%	-0.4%	-0.6%	-0.7%		0.2%	0.0%	-0.1%		-0.7%	-1.0%	-1.2%		-0.2%	-0.4%	-0.6%		-0.4%	-0.6%	-0.8%
coal		1.0%	1.3%	1.9%	0.8%		-0.1%	0.1%	0.9%		1.2%	1.0%	1.1%		0.5%	0.6%	0.8%		0.1%	0.1%	0.1%
gas		-2.8%	-4.9%	-6.8%	-5.6%		0.0%	-0.7%	-1.9%		-8.4%	-12.0%	-15.5%		-3.5%	-5.8%	-8.2%		-2.3%	-3.9%	-5.2%
nuclear		0.8%	2.2%	2.8%	2.5%		0.0%	0.0%	0.0%		2.3%	7.7%	8.2%		1.9%	3.6%	6.9%		2.6%	3.7%	4.7%
renewables		1.4%	2.5%	3.4%	3.4%		1.3%	1.4%	2.2%		3.2%	2.1%	5.0%		3.1%	4.7%	5.3%		1.1%	2.9%	4.4%
other		0.2%	0.2%	0.3%	0.1%		-0.2%	-0.3%	0.0%		0.1%	0.0%	0.0%		0.0%	0.1%	0.1%		0.0%	-0.1%	0.0%
PRIMARY ENERGY (quadrillion Btu)																					
Consumption		0.3%	0.5%	0.6%	0.5%		0.2%	0.2%	0.2%		0.1%	0.1%	0.1%		0.3%	0.3%	0.3%		0.3%	0.3%	0.4%
liquids		0.3%	0.4%	0.5%	0.3%		0.0%	0.0%	0.0%		0.1%	0.1%	0.1%		0.1%	0.1%	0.1%		0.2%	0.0%	0.3%
natural gas		-0.4%	-0.8%	-1.1%	-0.6%		-0.5%	-0.7%	-1.1%		-1.2%	-1.4%	-1.6%		-0.2%	-0.3%	-0.5%		0.7%	0.5%	0.5%
coal		1.0%	1.2%	1.8%	0.7%		1.3%	1.8%	2.2%		1.6%	1.6%	1.7%		1.2%	1.3%	1.4%		0.0%	0.0%	0.0%
other		0.9%	1.9%	2.6%	2.5%		0.7%	0.8%	1.0%		0.4%	0.6%	0.8%		0.4%	0.6%	0.8%		0.3%	0.6%	0.6%
Production		1.9%	3.4%	5.0%	4.9%		1.2%	1.8%	2.1%		2.5%	3.1%	3.4%		2.1%	2.7%	3.1%		2.5%	2.9%	3.5%
ENERGY RELATED CO2 EMISSIONS (including liquefaction) (million metric tons)		0.3%	0.3%	0.4%	0.2%		0.3%	0.4%	0.4%		0.3%	0.2%	0.2%		0.4%	0.4%	0.4%		0.3%	0.2%	0.2%
ECONOMIC INDICATORS																					
Gross Domestic Product (B 2005 chain-weighted $)		0.1%	0.1%	0.2%	0.2%		0.0%	0.0%	0.1%		0.1%	0.1%	0.2%		0.1%	0.1%	0.2%		0.1%	0.2%	0.2%
Total industrial shipments (B 2005$)		0.2%	0.2%	0.2%	0.1%		0.0%	0.0%	-0.1%		0.1%	0.0%	0.0%		0.2%	0.2%	0.3%		0.2%	0.2%	0.4%
Non-farm employment (millions)		0.1%	0.1%	0.2%	0.1%		0.0%	0.0%	0.1%		0.1%	0.1%	0.1%		0.1%	0.1%	0.2%		0.1%	0.1%	0.2%
Annual change in Consumer Price Index		0.2%	0.1%	-0.1%	-0.2%		-0.2%	-0.8%	-1.8%		-1.7%	-1.8%	-2.4%		0.3%	-0.1%	0.0%		0.7%	0.1%	0.3%

FOOTNOTE

(1) Total natural gas consumption. Liquefaction includes natural gas consumed in the export liquefaction facility. Other includes natural gas used in the transportation sector, for pipeline fuel, and for lease and plant fuel.

Projections: EIA, Annual Energy Outlook 2014 National Energy Modeling System runs refaeo.d062614a, ref12.d080214a, ref16.d080214a, ref20.d080214a, ref20p.d100614a, hmacaeo.d072014a, hmac12.d080214a, hmac16.d080214a, hmac20.d080614a, rclncaeonclgn.d090914a, rclnc12nclgn.d090914a, rclnc16nclgn.d090914a, rclnc20nclgn.d090914a, lresaeo.d071414a, lres12.d073114a, lres16.d080614a, lres20.d080214a, hresaeo.d062614a, hres12.d073114a, hres16.d080614a, hres20.d080614a

THE MACROECONOMIC IMPACT OF INCREASING U.S. LNG EXPORTS

October 29, 2015



OXFORD ECONOMICS LTI center for energy studies Rice University's Baker Institute for Public Policy

Exhibit R
Page 1 of 188

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This work was performed under DOE NETL Contract Number DE-FE0004002; SCNGO Task 200.01.01.000.

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Executive Summary

Key Findings:

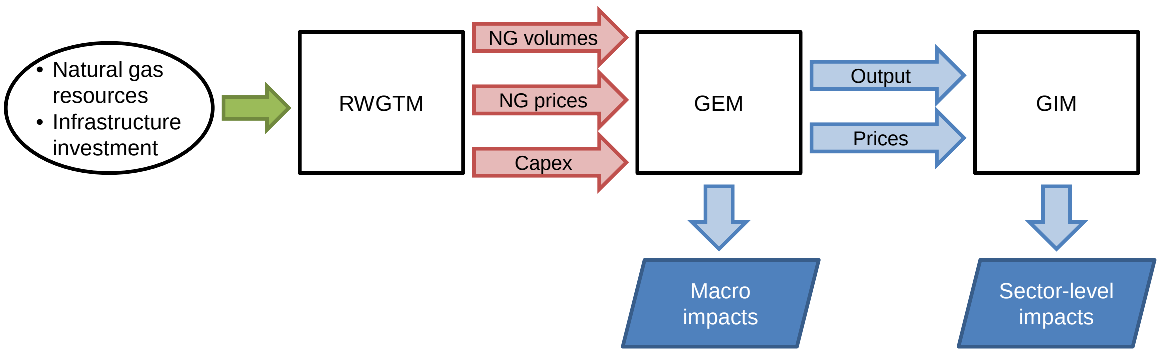
- **Rising liquefied natural gas (LNG) exports are associated with a net increase in domestic natural gas production.** The study finds that the majority of the increase in LNG exports is accommodated by expanded domestic production rather than reductions in domestic demand.
- **As exports increase, the spread between U.S. domestic prices and international benchmarks narrows.** In every case, greater LNG exports raise domestic prices and lower prices internationally. The majority of the price movement (in absolute terms) occurs in Asia.
- **The overall macroeconomic impacts of higher LNG exports are marginally positive, a result that is robust to alternative assumptions for the U.S. natural gas market.** With external demand for U.S. LNG exports at 20 billion cubic feet per day (Bcf/d), the impact of increasing exports from 12 Bcf/d is between 0.03 and 0.07 percent of gross domestic product (GDP) over the period of 2026–2040, or $7–$20 billion USD annually in today's prices
- **An increase in LNG exports from the United States will generate small declines in output at the margin for some energy-intensive, trade-exposed industries**. The sectors that appear most exposed are cement, concrete, and glass but the estimated impact on sector output is very small compared to expected sector growth to 2040.
- **Negative impacts in energy-intensive sectors are offset by positive impacts elsewhere.** Other industries benefit from increasing U.S. LNG exports, especially those that supply the natural gas sector or benefit from the capex needed to increase production. This includes some energy-intensive sectors and helps offset some of the impact of higher energy prices.

The Center for Energy Studies (CES) at Rice University's Baker Institute and Oxford Economics were commissioned by Leonardo Technologies, Inc. (LTI) on behalf of the Department of Energy (DOE) to undertake a scenario-based assessment of the macroeconomic impact of alternative levels of U.S. LNG exports under a range of assumptions concerning U.S. resource endowment, U.S. gas demand, and the international market environment. This report presents the findings of this analysis, highlighting key assumptions and impact channels. Background material describing the rationale behind this report can be found in Annex A.

The growth in shale gas production in the United States has presented a number of opportunities and challenges for the U.S. economy. On the one hand, U.S. shale gas production has lowered the domestic price of natural gas so that the United States now has among the lowest prices in the world. This has been a boon for consumers and led to gains in competitiveness for U.S. manufacturers. On the other hand, low gas prices in the United States negatively impact the profitability of U.S. domestic natural gas upstream and midstream operators, but have spurred interest in exporting LNG from the United States to higher priced markets. While selling natural gas at higher prices on the world market would increase profits for U.S. gas producers, the narrowing of the price gap between the United States and the rest of the world would erode some of the benefits that have accrued to U.S. consumers and manufacturers. Considering these potential tradeoffs, this paper examines whether it is ultimately economically advantageous for the United States to export LNG between 12 and 20 Bcf/d.

The analysis presented in this paper uses a highly specialized, multi-stage modeling approach highlighted in Figure ES1. First, the Center for Energy Studies at Rice University's Baker Institute used its Rice World Gas Trade Model (RWGTM) to simulate various alternative futures for the global natural gas market. These output data are then input into the Oxford Economics Global Economic Model (GEM) and Global Industry Model (GIM) to simulate broad macroeconomic and sectoral impacts of the various alternative paths for the global gas market.

Figure ES1. Modeling Approach



A comprehensive set of scenarios were prepared to understand the impact of higher U.S. LNG exports under a range of circumstances for domestic and international gas markets. This was done to establish conclusions that are not dependent on any particular set of starting conditions for the U.S. or international gas markets, and to highlight the impact of increasing U.S. LNG exports under alternative domestic and international conditions. The Reference domestic case (Ref) assumes existing energy policy in the United States continues and assumptions regarding the resource endowment are consistent with those of the Energy Information Administration (EIA). The alternative domestic cases assume a higher gas resource recovery (HRR) in the United States, a lower gas resource recovery (LRR) in the United States, and a higher U.S. demand for natural gas (Hi-D).

The Reference international case assumes that current energy policies around the world—including those setting domestic prices, dictating exports/imports, and/or addressing the environment—continue unchanged, while the macroeconomic outlook outside of the United States is drawn from the Oxford GEM. We then consider sets of circumstances that result in different international demand pull for U.S.-sourced LNG—the variants considered are international conditions sufficient to support 12 Bcf/d and 20 Bcf/d of U.S. LNG exports. Table ES1 outlines the full matrix of scenarios that were considered.

Table ES1. Study Scenarios

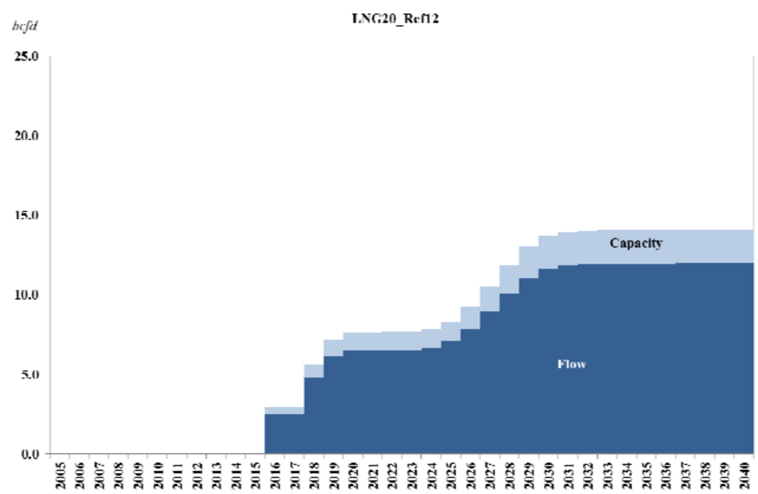
		Domestic Scenarios			
International Demand Scenarios		Reference	High Resource Recovery	Low Resource Recovery	High Natural Gas Demand
Reference		Ref_Ref	Ref_HRR	Ref_LRR	Ref_Hi-D
Global Demand for U.S. LNG Supports 12 Bcf/d		LNG12_Ref	LNG12_HRR	LNG12_LRR	LNG12_Hi-D
Global Demand for U.S. LNG Supports 20 Bcf/d	U.S. LNG Exports 12 Bcf/d	LNG20_Ref12	LNG20_HRR12	LNG20_LRR12	LNG20_Hi-D12
	U.S. LNG Exports 20 Bcf/d	LNG20_Ref20	LNG20_HRR20	LNG20_LRR20	LNG20_Hi-D20
	U.S. LNG Exports Endogenous	LNG20_Ref	LNG20_HRR	LNG20_LRR	LNG20_Hi-D

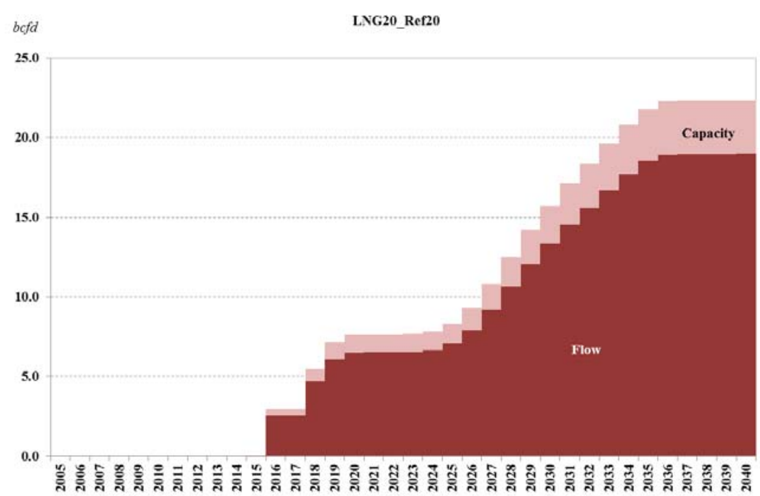
The primary focus of the study is to assess the impact of U.S. LNG exports rising above 12 Bcf/d in circumstances where international demand is high enough to support 20 Bcf/d of U.S. LNG exports (the bottom three rows of Table ES1 highlighted above). Greater volumes of LNG exports support continued long-term expansion of U.S. production. The scenario analysis reveals that domestic production continues to increase throughout the time horizon when LNG export volumes can expand to 20 Bcf/d. This contrasts to the case when exports do not exceed 12 Bcf/d and production plateaus and declines slightly in the 2030s. The majority of the increase in LNG exports is accommodated by expanded domestic production rather than reductions in domestic demand, a result that reflects the very elastic long-run supply curve in North America. Greater LNG exports effectively serve as additional demand for U.S. natural gas, which facilitates expansion in the domestic upstream sector.

The analysis also shows that the spread between Henry Hub prices and other international benchmark prices narrows as U.S. LNG exports increase. Increased exports from the United States help to alleviate the highly constrained supply situation internationally, although supplies from other regions also play a role. Altogether, the spread between Henry Hub price and international benchmark prices abroad narrows with greater volumes of U.S. LNG exports, it remains large enough to support the flow of trade. In fact, when U.S. LNG exports are determined endogenously, meaning they generally exceed 20 Bcf/d, the price spreads are narrowest thereby reflecting full capture of the U.S. LNG arbitrage opportunity. Finally, the majority of the price movement occurs abroad, not domestically, with the most significant impact occurring in Asia.

In the scenarios where international demand pull is sufficient to support 20 Bcf/d of U.S. LNG exports, the export volume growth occurs primarily after the mid-2020s. Figure ES2 highlights U.S. LNG export capacity and export volumes across the 12 Bcf/d and 20 Bcf/d cases under the Reference domestic case assumptions, respectively. Of note is the fact that the two scenarios do not differ much from each other until after 2030. This occurs because international demand for U.S. LNG must grow beyond what is already slated to begin supplying the market over the next few years, which includes Australia and already approved U.S. LNG export capacity. So, while international demand continues to increase, it must first work through a large amount of available LNG supply before turning to U.S.-sourced LNG to balance the global market.

Figure ES2. LNG Export Capacities and Volumes in the LNG20_Ref12 and LNG20_Ref20 Cases

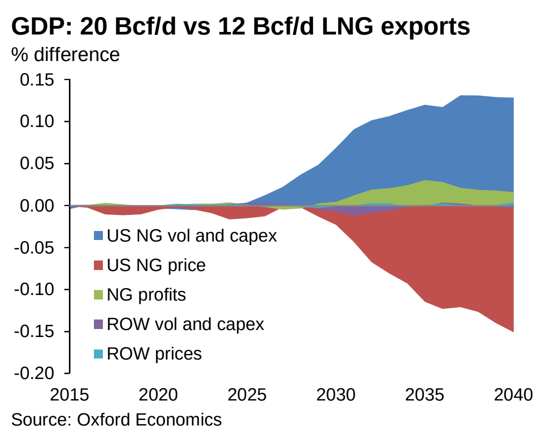




The macroeconomic impacts of increasing U.S. LNG exports to 20 Bcf/d from 12 Bcf/d can be decomposed into five main channels. These are (1) higher U.S. natural gas production and investment; (2) higher U.S. natural gas prices; (3) recycling of extra profits from the U.S. natural gas sector; (4) changes to natural gas production and investment in the rest of the world; and (5) lower international gas prices. The first two channels are the most significant for the United States and broadly offset each other.

The overall macroeconomic impacts of increasing U.S. LNG exports to 20 Bcf/d from 12 Bcf/d are small, reflecting the small size of the shocks relative to the economy overall (see Figure ES3). In the Reference domestic scenario, the increase in net gas exports is equivalent to 0.02 percent of GDP on average over 2026–2040, and the incremental investment in the gas sector associated with the increase in exports in that span is just 0.06 percent of GDP. In aggregate, the size of the economy is little changed in the long run, with GDP 0.03 percent ($7.7 billion USD annually in today's prices) higher on average over 2026–2040 than in the 12 Bcf/d export case.

Figure ES3. GDP Impact by Channel, 20 Bcf/d vs. 12 Bcf/d LNG Exports in the Reference Domestic Scenario

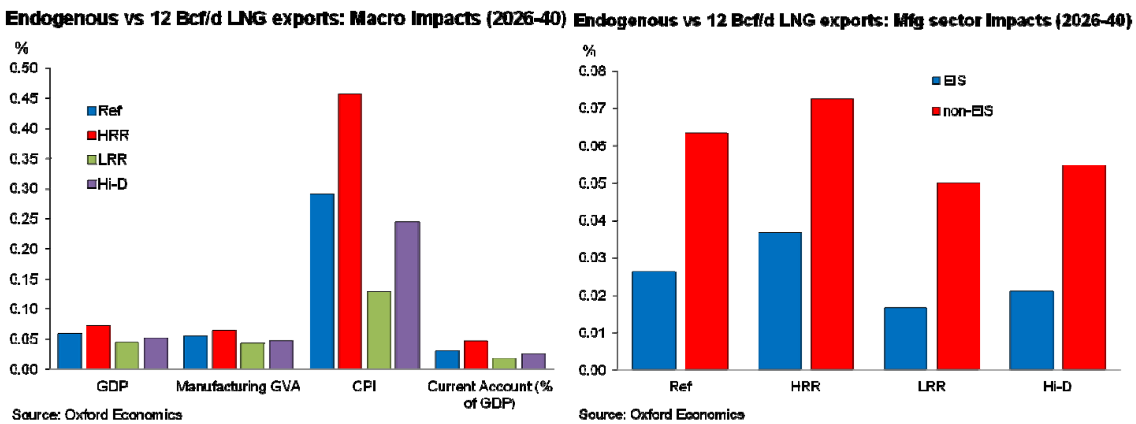


Impacts vary at the sector level. Firms that supply the natural gas sector and are involved in developing the infrastructure and supply chains needed to increase production and LNG exports benefit. This includes firms in the construction and metals sectors. However, higher natural gas prices in the United States associated with greater U.S. LNG exports are negative for the energy-intensive manufacturing sectors. It is important to note, however, that even in the energy-intensive sectors—such as such as glass, cement, and chemicals—the impacts are small compared with the expected growth in output through 2040.

When U.S. LNG exports rise to their market determined level (rather being held to 20 Bcf/d), the macroeconomic dynamics are the same as highlighted above but with a slightly larger overall impact, reflecting the higher level of U.S. gas exports, production, and associated investment. The impact on Henry Hub prices is also larger, but this is not sufficient to offset the extra stimulus to the U.S. economy from greater LNG exports. In the Reference domestic case, the impact on GDP is on average 0.06 percent over the period 2026–2040.

The conclusions are robust to alternative assumptions regarding U.S. gas resources and demand. The overall gain for the U.S. economy is greatest in the High Resource Recovery (HRR) scenario as this is associated with largest increase in domestic gas production and exports, but the impacts are also positive in the Low Resource Recovery (LRR) and High Domestic Demand (Hi-D) cases (Figure ES4 and Table ES2).

Figure ES4. Economic Impacts of Increasing LNG Exports, 2026–2040



The results detailed in this report suggest that the overall macroeconomic impacts of LNG exports are marginally positive. Across the domestic cases, the positive impacts of higher U.S. gas production, greater investment in the U.S. natural gas sector, and increased profitability of U.S. gas producers typically exceeds the negative impacts of higher domestic natural gas prices associated with increased LNG exports.

Table ES2. Impact of Increasing LNG Exports, Annual Avg. Change from 12 Bcf/d, 2026–2040

	12 Bcf/d to 20 Bcf/d LNG Exports		12 Bcf/d to Market-Determined (endogenous) LNG Export Level			
	Reference	High Resource Recovery	Reference	High Resource Recovery	Low Resource Recovery	High Natural Gas Demand
U.S. Natural Gas Market (Bcf/d)						
NG Production	3.7	5.1	4.8	8.4	2.5	4.0
	4.0%	*5.1%*	*5.2%*	*8.5%*	*2.8%*	*4.1%*
NG Consumption	0.1	0.3	0.1	0.5	0.0	0.2
	0.1%	*0.3%*	*0.1%*	*0.5%*	*0.0%*	*0.2%*
NG Exports	4.3	5.1	5.4	8.5	2.7	4.3
	26%	*28%*	*33%*	*47%*	*17%*	*26%*
NG Imports	0.7	0.4	0.7	0.7	0.2	0.4
	4.2%	*2.4%*	*4.3%*	*4.6%*	*1.2%*	*2.6%*
Prices (2010$)						
Henry Hub Price	$0.27	$0.25	$0.32	$0.41	$0.19	$0.29
	4.3%	*4.7%*	*5.2%*	*7.5%*	*2.6%*	*4.3%*
NBP (UK)	$0.00	-$0.02	$0.02	-$0.04	-$0.02	-$0.03
	0.0%	*-0.1%*	*0.1%*	*-0.4%*	*-0.2%*	*-0.3%*
German Border (NW Europe)	$0.01	$0.00	$0.02	-$0.01	-$0.01	-$0.01
	0.1%	*0.0%*	*0.1%*	*-0.1%*	*-0.1%*	*0.0%*
JKM (Asia-Pacific)	-$1.23	-$1.52	-$1.51	-$2.24	-$0.84	-$1.21
	-6.8%	*-8.4%*	*-8.4%*	*-12.4%*	*-4.6%*	*-6.7%*
Macroeconomic Impacts						
GDP (annual avg., 2014$B)	$7.7	$7.3	$16.7	$20.5	$12.5	$14.4
	0.03%	*0.03%*	*0.06%*	*0.07%*	*0.04%*	*0.05%*
Employment (000s)	9.6	11.3	24.1	35.2	18.4	19.2
	0.01%	*0.01%*	*0.01%*	*0.02%*	*0.01%*	*0.01%*
CPI (level)	0.24%	0.30%	0.29%	0.46%	0.13%	0.24%
Current Account (% of GDP)	0.02	0.03	0.03	0.05	0.02	0.03
Sector Value-Added:						
Manufacturing	0.02%	0.02%	0.06%	0.06%	0.04%	0.05%
EIS	0.01%	0.02%	0.03%	0.04%	0.02%	0.02%
Non-EIS	0.03%	0.02%	0.06%	0.07%	0.05%	0.05%
Agriculture	0.01%	0.02%	0.02%	0.04%	0.01%	0.01%
Extraction	1.81%	2.39%	2.34%	3.94%	1.23%	1.90%
Construction	0.16%	0.15%	0.27%	0.34%	0.18%	0.23%
Services	-0.01%	-0.02%	0.00%	-0.02%	0.01%	0.00%

1 Introduction

The application of horizontal drilling with hydraulic fracturing has triggered perhaps the most transformative development in energy markets in recent history. The so-called "shale gas revolution" has seen production of natural gas extracted from ultralow permeability, ultralow porosity shale formations in the United States ramp up considerably. As noted in previous literature, the scale of the shale gas resource and the pace at which its production is expanding carries both economic and geopolitical implications (see, for example, Medlock, Jaffe, and Hartley [2011]).

Shale gas in the United States has grown in less than a decade to comprise about one-half of U.S. domestic production. The rapid expansion of domestic production has made the prospect of U.S. liquefied natural gas (LNG) *exports*—unthinkable just a decade ago—an emerging reality. This will impact U.S. domestic natural gas upstream and midstream operators as well as domestic economic interests farther downstream, particularly in gas-intensive industries, and raises questions about the net macroeconomic impact of the interactions and tradeoffs among LNG exporters, upstream producers, midstream operators, and domestic consumers.

U.S. shale gas production has already tangibly lowered the price of natural gas for domestic consumers. From 2003–2006, U.S. natural gas prices were among the highest in the world. However, the United States now enjoys among the lowest prices in the world. Moreover, the dramatic drop in domestic price owing to rapidly expanding domestic production has impacted fuel use in power generation—namely the substitution of natural gas for coal—and has instigated deeper discussion centering on natural gas as a bridge to a low-carbon future. In general, low-cost and abundant natural gas reduces the impact on electricity rates of addressing a variety of environmental concerns in the power-generation sector.

Furthermore, low-price natural gas is contributing to a revitalization of the industrial base in the United States. The economic benefit at the upstream level is apparent, as employment numbers in the upstream oil and gas sector have increased to support the very active shale drilling programs, which require relatively high levels of labor input.[1] Farther downstream, there are also ongoing and planned expansions in the petrochemical and manufacturing sectors, a development fueled by low-cost natural gas. Indeed, the recent era of low natural gas prices has been widely touted as a boon to domestic manufacturers, particularly in energy-intensive manufacturing industries such as chemicals, glass, and metals.

At the same time, natural gas producers are understandably eager to take advantage of higher prices on the global market. To date, the U.S. Department of Energy (DOE) has received requests for LNG export licenses for export capacity totaling nearly 47 billion cubic feet per day (Bcf/d).[2] However, some question whether it is ultimately economically advantageous for the United States to export LNG, arguing that the price advantage enjoyed by U.S. manufacturers is a key competitive advantage. Indeed, the U.S. DOE is required to assess whether or not exports to non-FTA countries is in the public interest, a so-called public interest determination.

Further, for all of the discussion of LNG exports as new source of demand for domestically produced natural gas, high volumes of LNG exports are not a forgone conclusion (see Medlock [2012, 2014]).

[1] See Hartley, Medlock, Temzelides, and Zhang (2014) and Agerton, Hartley, and Medlock (2015).

[2] At the time of this writing, FTA license applications totaled just over 46 Bcf/d and non-FTA license applications totaled just over 41 Bcf/d.

International supply and demand conditions are important for understanding how North American natural gas fits into the global supply picture. U.S. natural gas will be an attractive source of supply to foreign consumers as long the cost to deliver is competitive with other sources of supply. Moreover, the commensurate investments in production, liquefaction, and shipping must remain attractive to investors. As such, when assessing the potential impacts of greater U.S. LNG exports it is important to consider how the North American natural gas market might evolve under different scenarios defined by variations in both domestic and international market drivers.

The primary purpose of this study is to assess the net macroeconomic impacts on the U.S. economy of greater LNG exports under a range of domestic and international market conditions. As will be expounded below, this includes alternative assumptions for domestic resource availability, domestic gas demand, and a range of international supply and demand conditions that generate different potential market pull for U.S. LNG exports. This paper assesses the impact of increasing U.S. LNG exports under these different domestic and international scenarios.

The remainder of this report is structured as follows. Section 2 outlines the modeling approach used in the study and presents the range of scenarios modeled. Section 3 describes the assumptions driving the natural gas market in each scenario. Section 4 presents the results of the analysis and highlights key drivers. Section 5 offers some concluding remarks. Finally, detailed model descriptions and detailed results for all scenarios are included in the Annexes.

2 Methodology

2.1 Modeling Approach

The analysis presented in this paper uses a highly specialized, multi-stage modeling approach. First, the Center for Energy Studies (CES) at Rice University's Baker Institute used its Rice World Gas Trade Model (RWGTM) to simulate various alternative futures for the global natural gas market.[3] Specifically, the RWGTM is used to investigate how various assumptions about international and domestic demand and resource availability could impact the U.S. natural gas market over the coming decades. Since economic, geopolitical, and technological forces can shape market outcomes in many different ways, the non-stochastic nature of the RWGTM facilitates analysis of multiple scenarios that characterize how these various factors impact current and future investment decisions.[4]

In general, the RWGTM is used to consider possible paths for natural gas investments, production, consumption, and prices—both regional and global—incorporating various economic, geopolitical, and other investment and trade barriers and incentives, thus allowing an assessment of the effects of

[3] The RWGTM was developed by Kenneth B. Medlock III and Peter R. Hartley at Rice University using the MarketBuilder software platform provided through a research license with Deloitte MarketPoint, LLC. The architecture of the RWGTM, the data inputs, and modeled political dimensions are distinct to Rice and its researchers. The RWGTM is used to evaluate how different geopolitical pressures, domestic policy frameworks, and market developments can influence the long-run evolution of regional and global gas markets and how those developments in turn influence geopolitics. A brief description of the RWGTM is contained in Annex B of this report, and more detail is available upon request.

[4] A significant core data constituent of this analysis is rooted in recently published Baker Institute Center for Energy Studies research (see *The Market Impacts of New Natural Gas-Directed Policies*). This study, funded by the Alfred P. Sloan Foundation, is available at http://bakerinstitute.org/center-for-energy-studies/. As detailed therein, that study utilizes data derived from other ongoing studies, namely those at The University of Texas Bureau of Economic Geology (*Shale Resources and Reserve Study*), Resource for the Future (*Managing the Risks of Shale Gas Development*), and the University of Colorado-Denver (*Understanding the Politics of Shale Gas Development: A Focus on Colorado, New York, and Texas)*. The study at the UT Bureau of Economic Geology provides critical benchmarking for shale gas well decline profiles and production costs. Studies at RFF and CU-Denver provide indications of likely policy directions of local, State, and Federal Governments. All international components are derived from Baker Institute CES research.

these factors on natural gas market development.[5] The RWGTM can also be used to understand the effects of changes in core economic variables affecting energy production—such as fiscal terms, limits on access to resources, fixed and operating costs, constraints on rigs, equipment and personnel, and technology. For each scenario considered in this study, the model produces detailed outputs—both domestically and internationally—covering natural gas production, trade, and prices, as well as associated capital investment in the natural gas value chain.

These output data are then input into the Oxford Economics Global Economic Model (GEM) to simulate the broad macroeconomic impacts of the various alternative paths for the global natural gas market. The GEM covers 46 economies in detail and provides headline statistics for another 35 economies. The model provides a rigorous and consistent structure for analysis and forecasting, and allows the implications of alternative global scenarios and policy developments to be readily analyzed at the macro level.[6] This stage of the analysis assesses the effect of changes in natural gas supply, trade, and prices on gross domestic product (GDP), total industry and manufacturing, competitiveness, consumer and producer prices levels, and the current account.

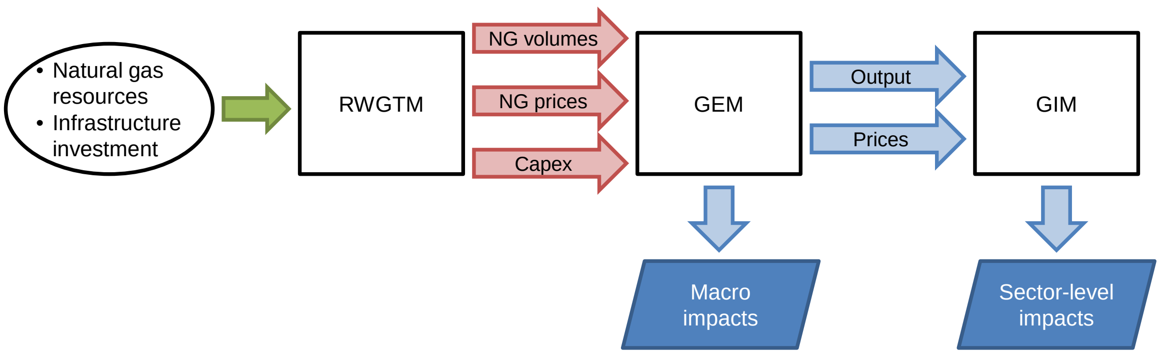
Finally, the macroeconomic outputs from the GEM are then input into the Oxford Economics Global Industry Model (GIM), which models the impact on activity at the sector level. The GIM covers 100 sectors in 67 countries. Forecasts for individual industries are driven by the macroeconomic forecast—consumption, investment, and exports—combined with detailed modeling of industry interactions, such as supply-chain linkages. Improvement in sector competitiveness allows capture of

[5] It should be noted that economic and political influences are not necessarily mutually exclusive, since policy can initiate changes in economic parameters.
[6] It is of note that the GEM is unique among commercial economic consultancies.

greater market share in the domestic and international market, where competitiveness is driven by exchange rate developments, labor costs, and energy prices.

Figure 1 highlights the modeling approach, and a more detailed description of the models used in this study can be found in Annex B.

Figure 1. Modeling Approach



2.2 Macroeconomic Impact Channels

The oil and gas sector is a relatively small component of the U.S. economy overall, accounting for around 1.3 percent of total output and 0.1 percent of non-farm payrolls in 2014. However, despite its relatively small size in the national accounts, energy is a key input in virtually every sector and changes in energy prices affect the entire economy.

An increase in U.S. LNG exports would be expected to impact the U.S. economy[7] through the following key transmission channels:

[7] The impacts described are relative to what would otherwise have happened, i.e., if there was not an increase in U.S. LNG exports.

- Increased gas production directly contributes to GDP, and the export of natural gas will increase export revenue and improve the U.S. current account.
- Increased production will also have positive spillovers to in key suppliers of the sector such as machinery and engineering services, and rising employment in the gas sector also leads to increased demand for goods and services more broadly.
- The incremental investment needed to facilitate higher natural gas production and exports should also boost economic activity in the United States.
- The additional investment will also have multiplier effects through the supply chains of the construction, cement, and metal products sectors that lead to further gains in output and employment.
- Henry Hub prices are higher than they would otherwise be as U.S. LNG exports increase because producers increasingly exploit reserves with higher extraction costs. Higher natural gas prices will erode consumers' purchasing power both directly and indirectly as the impact of higher domestic natural gas prices filters through the supply chains of other sectors causing the prices of other goods and services to rise. This will negatively impact consumption with the energy-intensive sectors being most affected.
- Changes in relative natural gas prices across countries will impact U.S. competiveness. If energy prices in the United States rise relative to energy prices in the rest of the world, this raises production costs for U.S. firms relative to international competitors. This erosion in U.S. competitiveness will weigh on the U.S. trade balance. The tradable energy-intensive sectors such as chemicals and steel will generally be most exposed to shifts in industrial competitiveness.

- Increased production and higher Henry Hub gas prices[8] should generate higher profits for natural gas producers. The improved profitability should, in turn, ultimately raise U.S. income either through the distribution of profits or by increasing equity market value of listed companies.
- Variations in natural gas production and investment outside the United States will also impact U.S. businesses that are dependent on overseas natural gas production and investment activity. Changes to natural gas prices in the rest of the world will also affect global economic activity and impact demand for all U.S. exports.

2.3 Scenario Approach

The study analyzes a comprehensive set of scenarios to understand the impact of higher U.S. LNG exports under a range of circumstances. A wide range of scenarios are analyzed in order to establish conclusions that are not dependent on any particular set of starting conditions for the U.S. or international gas markets. The scenario assumptions fall along two core dimensions. In one dimension, we consider different U.S. domestic market conditions with regard to resources and domestic demand. In the other dimension, we consider specific circumstances that result in different international demand pull for U.S.-sourced LNG for each domestic scenario. Table 1 outlines this approach.

[8] It should be noted that it is assumed that U.S. exporters receive the Henry Hub price rather than the price in the destination market.

Table 1. Study Scenarios

International Demand Scenarios		Domestic Scenarios: Reference	High Resource Recovery	Low Resource Recovery	High Natural Gas Demand
Reference		Ref_Ref	Ref_HRR	Ref_LRR	Ref_Hi-D
Global Demand for U.S. LNG Supports 12 Bcf/d		LNG12_Ref	LNG12_HRR	LNG12_LRR	LNG12_Hi-D
Global Demand for U.S. LNG Supports 20 Bcf/d	U.S. LNG Exports 12 Bcf/d	LNG20_Ref12	LNG20_HRR12	LNG20_LRR12	LNG20_Hi-D12
	U.S. LNG Exports 20 Bcf/d	LNG20_Ref20	LNG20_HRR20	LNG20_LRR20	LNG20_Hi-D20
	U.S. LNG Exports Endogenous	LNG20_Ref	LNG20_HRR	LNG20_LRR	LNG20_Hi-D

Note that the scenarios are constructed so that there is sufficient international demand to support commercially viable LNG export flows from the United States in accordance with the volumes indicated in each case. Thus, various assumptions are made about the international natural gas market so as to stimulate investment in the U.S. upstream sector and the commensurate development of LNG export infrastructure. The scenarios indicated in Table 1 are defined as follows, moving first from left to right then top to bottom:

- **Ref_Ref** is defined as the Reference international demand case coupled with the Reference domestic case, hence the mnemonic Ref_Ref.
- **Ref_HRR** is defined as the Reference international demand case with a *higher* level of recoverable resource in the United States than in the Ref_Ref case.

- **Ref_LRR** is defined as the Reference international demand case with a *lower* level of recoverable resource in the United States than in the Ref_Ref case.
- **Ref_Hi-D** is defined as the Reference international demand case with a *higher* level of demand in the United States than in the Ref_Ref case.
- **LNG12_Ref** is defined by a *higher* level of international demand for U.S.-sourced LNG where domestic demand is consistent with the Ref_Ref case.
- **LNG20_Ref** is defined by a *significantly higher* level of international demand for U.S.-sourced LNG where domestic demand is consistent with the Ref_Ref case. LNG exports are endogenously determined.
- **LNG20_Ref12** is defined by a *higher* level of international demand for U.S.-sourced LNG where domestic demand is consistent with the Ref_Ref case. This case is, however, set up so that the U.S. exports of LNG do not exceed more than 12 Bcf/d.
- **LNG20_Ref20** is defined by a *higher* level of international demand for U.S.-sourced LNG where domestic demand is consistent with the Ref_Ref case. This case is, however, set up so that the U.S. exports of LNG do not exceed more than 20 Bcf/d.

In general, when reading the case nomenclature in Table 1, we note:

> "N1_N2X" where N1 denotes the name of the international demand scenario, N2 denotes the domestic scenario, and X denotes the level of LNG exports that *can* occur from the United States. Note that if X is not present, then the amount of LNG exports from the United States is fully endogenous to the scenario being considered.

Importantly, in each of the cases, the level of U.S. LNG exports is different if LNG exports are determined in a fully endogenous manner. This is due to the fact that altering the international market outlook through various mechanisms coupled with different assumptions about domestic demand or resource availability naturally leads to different outcomes. As such, the LNG20_Ref12 case can be compared to the LNG20_Ref20 case in a rather straightforward manner because the domestic and international settings are the same in the two cases as only the level of exports varies. By contrast, comparing scenarios with different underlying assumptions about the domestic and international market environments does not facilitate such a straightforward comparison. Therefore, in subsequent sections we generally compare the last three cases within each column in Table 1; so, for example, LNG20_HRR12 is compared to LNG20_HRR20 and LNG20_HRR.

As noted above, the international demand cases indicated in Table 1 are constructed in order to stimulate commercially viable flows of different U.S. LNG export volumes. The assumptions across the cases, so constructed, are detailed in Table 2.

Table 2. Select Natural Gas Market Assumptions Across International Demand Scenarios

		Reference	LNG12	LNG20
Accessible Shale Resource (tcf)	**World**	8,407	6,500	3,542
	Africa	1,918	1,918	0
	Asia and Pacific	2,107	1,075	90
	China	1,285	390	0
	Australia	529	529	90
	Europe	444	0	0
	South America	1,786	1,786	1,260
	North America	1,839	1,839	1,839
	United States	829	829	829
	Canada	498	498	498
	Mexico	513	513	513
	Rest of World	314	86	0
LNG New Build Capability		No limits.	Limited expansion capabilities in selected locations.	Only the United States has expansion capability beyond 2020.
Pipeline New Build Capability		No limits.	No future expansions of Central Asian pipelines to China.	LNG12 plus existing Russia-China pipeline supply agreements dissolve.
Demand		In all scenarios, a CO_2 trading platform is in place in Europe and the United States is assumed to retire 61 GWs of coal by 2030.	Chinese gas demand rises in response to policies to limit coal use; Japanese nukes remain offline.	LNG12 case plus CO_2 reduction protocols targeting coal use in India, Indonesia, South Korea, and a handful of other smaller coal consuming nations.

As indicated in Table 2, the Reference, LNG12, and LNG20 international demand scenarios adjust shale resource availability, pipeline and LNG infrastructure expansion opportunities outside the United States, and natural gas demand in different countries. For example, the capabilities for pipeline expansion to meet growing Asian demand are increasingly limited as we move into the higher international LNG demand cases. Specifically, the LNG12 case assumes there is no future expansion of

Russian pipeline capacity into China and the Far East beyond what has already been contracted. However, in the LNG20 case the existing agreement is assumed to dissolve, and Russia is assumed to never be connected by pipeline to China. Moreover, in both the LNG12 and LNG20 cases, it is assumed that there are no future pipeline expansions from Central Asia to China.

In addition to the above assumptions, we also vary assumptions regarding the domestic resource base and demand. Namely, in constructing these cases, we assume the total U.S. natural gas resource base is 2,525 tcf in the HRR case, 1,831 tcf in the LRR case, and 2,075 tcf in the Reference case. The total resource base is comprised of an accessible shale gas resource totaling 1,182 tcf in the HRR case, 688 tcf in the LRR case, and 829 tcf in the Reference case, with other resources making up the difference. As for domestic demand, in the Hi-D cases we assume 113 GW of coal-fired generation capacity are retired as the Clean Power Plan takes effect, which accounts for an additional 52 GW of retirements above the Reference case.[9]

[9] The distribution of the retirements is distinctly different than in the Reference case as each state must meet a specific target for carbon dioxide emissions reductions. While the exact impact of the Clean Power Plan is not known and highly uncertain, the primary point of the Hi-D scenario is to stimulate greater domestic demand for natural gas.

3 Natural Gas Market Impacts

As outlined in Table 1, there are a total of 20 scenarios that were considered in this analysis. The scenarios consider different domestic and international market conditions so that a robust view of the global natural gas market can be ascertained. In this section, we detail the Ref_Ref case then outline some high level results for the global natural gas markets across all cases, with a particular emphasis on the United States. This will enable a deeper understanding of the macroeconomic results that are detailed in subsequent sections. Detailed results for all cases can be found in the Annexes.

3.1 The Natural Gas Market in the Ref_Ref Case

The Ref_Ref case is the scenario that combines the Reference domestic market conditions with the Reference international market conditions. It assumes current policies in various places around the world—including those setting domestic prices, dictating exports/imports, and/or addressing the environment (for example renewables targets in the United States and internationally)—are persistent throughout the model time horizon, unless there is already action being undertaken. While this is not likely to be true, the Ref_Ref case serves as a benchmark so that shifts in market outcomes can be attributed to particular assumptions across scenarios. In sum, the Ref_Ref case captures geopolitical, contractual, and regulatory constraints that *currently* exist in the global gas market and are not already known to be different into the future. This includes:

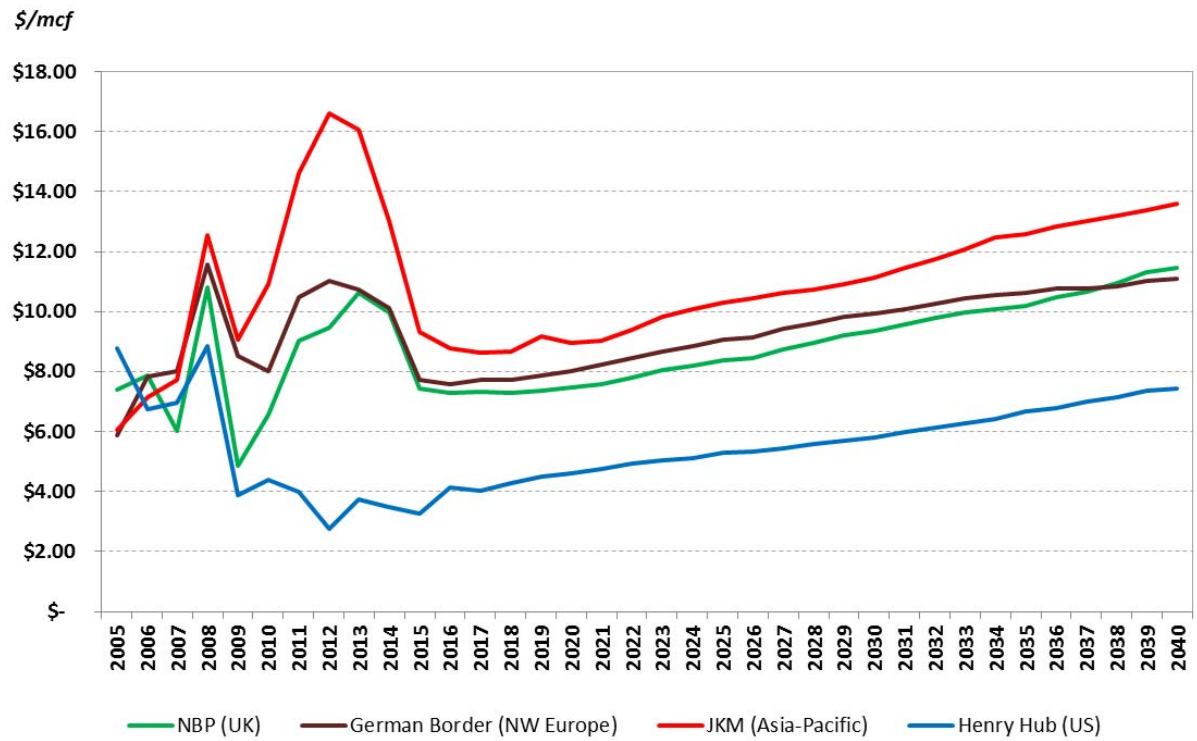
- Current pricing policies and export/import policies across countries remain as they are today throughout the model time horizon, unless there is already concerted action being undertaken to change the internal market.

- The construction of new LNG and pipeline infrastructure is generally allowed to occur according to commercial viability. However, in those countries where investments are hampered by geopolitical considerations, it will be assumed that those burdens are carried forward through the model time horizon. Thus, for example, current sanctions on Iran carry forward (although at the time of this writing this outcome is highly uncertain), and the investment risks associated with developments in countries such as Venezuela and Bolivia are assumed to persist.
- Current assumptions regarding the availability and competitiveness of emerging energy technologies are held fixed. So, there is no effort to accelerate the adoption of technologies that compete with natural gas through policies that have yet to be announced or enacted or through unanticipated innovations that lower the cost of competing energy sources and/or technologies.
- Current environmental policies are assumed to remain in place throughout the model time horizon. So, for example, it is assumed that the European Union (EU) will maintain an active CO_2 trading market but the United States will, collectively, not. While the price of carbon in the EU has fluctuated with policy treatment, it is carried forward in the RWGTM at $10 per tonne. We address current policy intervention addressing domestic CO_2 emissions through the Hi-D scenarios. It is also worth noting that the upcoming climate talks in Paris later this year could alter the policy frameworks in many countries. This possibility is addressed, at least in a rudimentary way, through the international LNG12 and LNG20 scenarios.

- Known natural gas resources, including shale, are developed according to commercial viability in North America and elsewhere. Existing bans on shale-directed activity are assumed to carry forward throughout the model time horizon. Again, there is considerable uncertainty regarding the commercial viability of shale around the world, and we address a potentially diminished role for shale through the domestic LRR scenario and the international LNG12 and LNG20 scenarios. We consider an enhanced role for shale in the domestic HRR setting only.

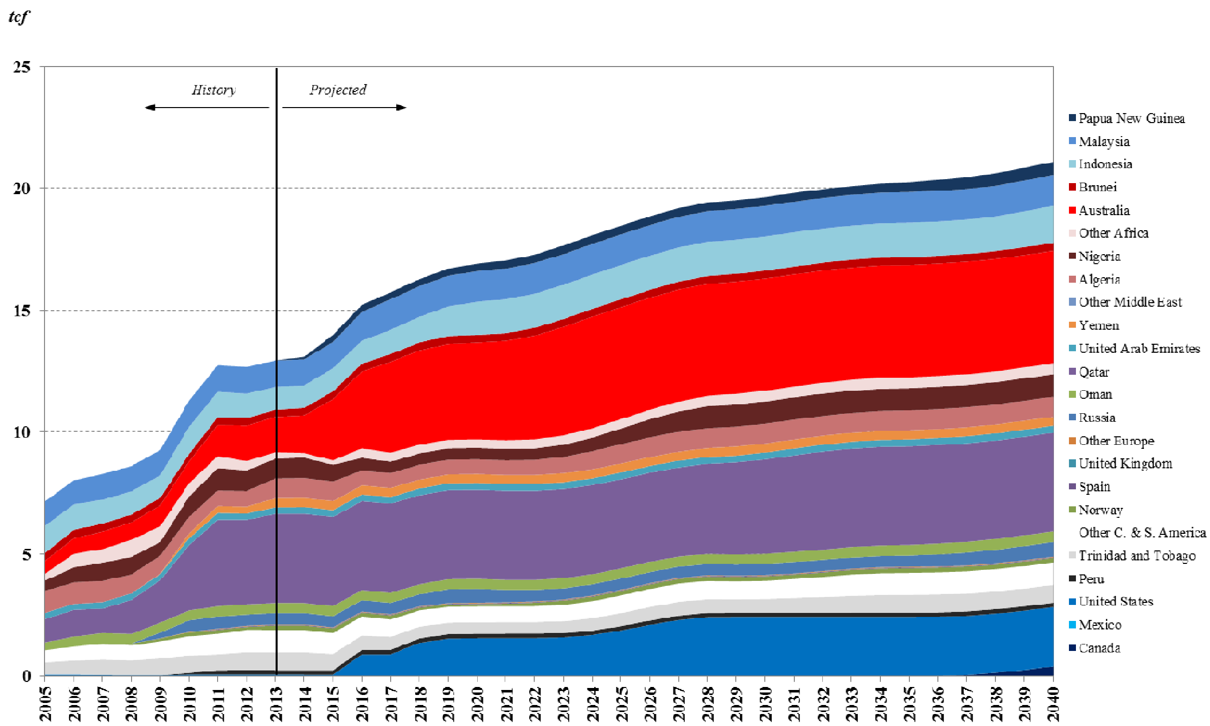
The Ref_Ref case reveals several interesting insights into how the North American, and global, gas market may evolve over the coming decades. To begin, it indicates the North American market will remain a low cost source of supply for natural gas for the foreseeable future. This has implications for regional competitiveness, demand, and international trade. Moreover, as can be highlighted through the scenarios examined in this study, the availability and production of natural gas from shale in the United States and around the world are critical to future market developments.

Figure 2. Select Global Prices (2010$) (Ref_Ref case)



As indicated in Figure 2, the price at Henry Hub remains below the prices in Asia (Japan Korea Marker or JKM) and Europe (National Balancing Point or NBP and German-Austrian Border), although the premium that emerged following the disaster at Fukushima in 2011 dissipates, and the long-term differentials in prices between regions reflects the cost of trade. Moreover, the emergence of new LNG supplies from Australia and the United States drive the total volume of global LNG trade to almost double current levels (see Figures 3 and 4). Importantly, U.S. LNG exports rise in the Ref_Ref case to about 6.5 Bcf/d, making it the third largest LNG exporter in the world, behind Australia and Qatar. A defining difference among the top three LNG exporters is that the United States is the single largest consumer of natural gas and its exports are fueled almost entirely by shale gas development.

Figure 3. Global LNG Exports by Region (Ref_Ref case)[10]

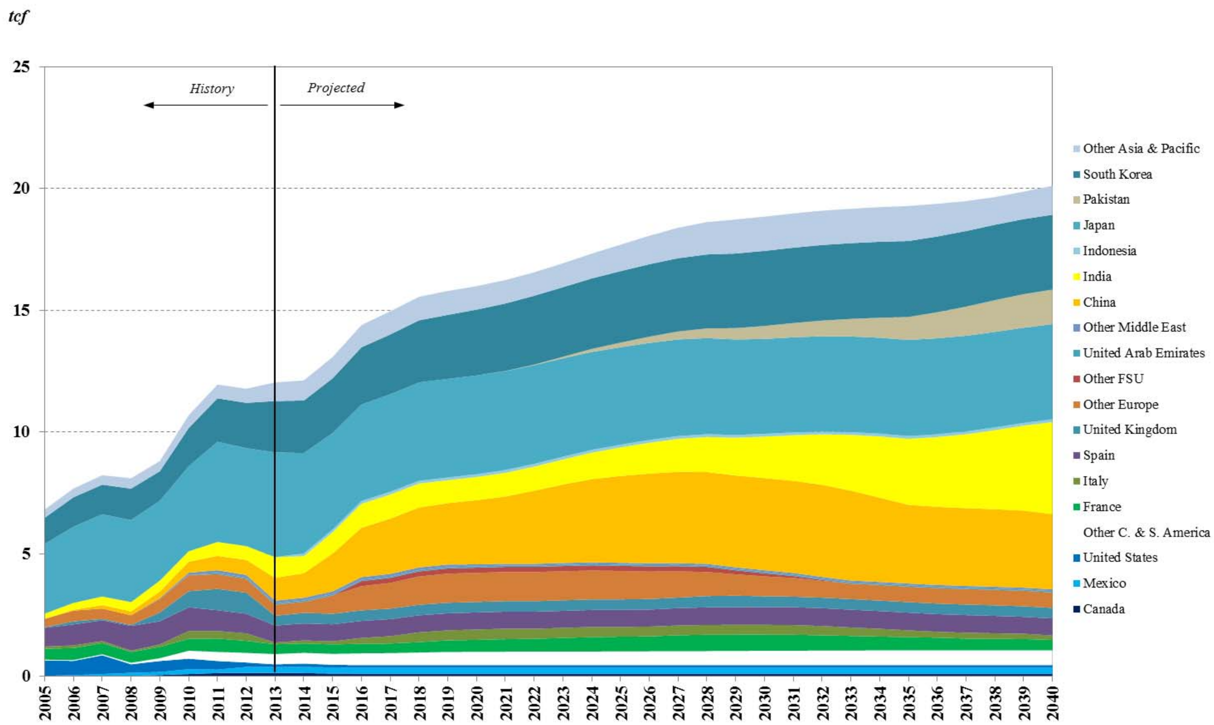


The near term increases in LNG trade indicated in Figures 3 and 4 primarily reflect the amount of LNG export capacity under construction in Australia and the United States. However, the decrease in Asian LNG prices discourages further LNG expansion in the near term. Nevertheless, expanded LNG trade is facilitated by a growing need for waterborne supplies to developing Asian economies (see Figure 5), which is fueled more generally by global demand growth (see Figure 5) that is largely occurring in regions with inadequate domestic resource endowments. This increase in demand, in turn, spawns

[10] The data for exports includes losses during liquefaction.

supply growth in regions that can, through trade via both LNG and pipeline, accommodate those new demands.[11]

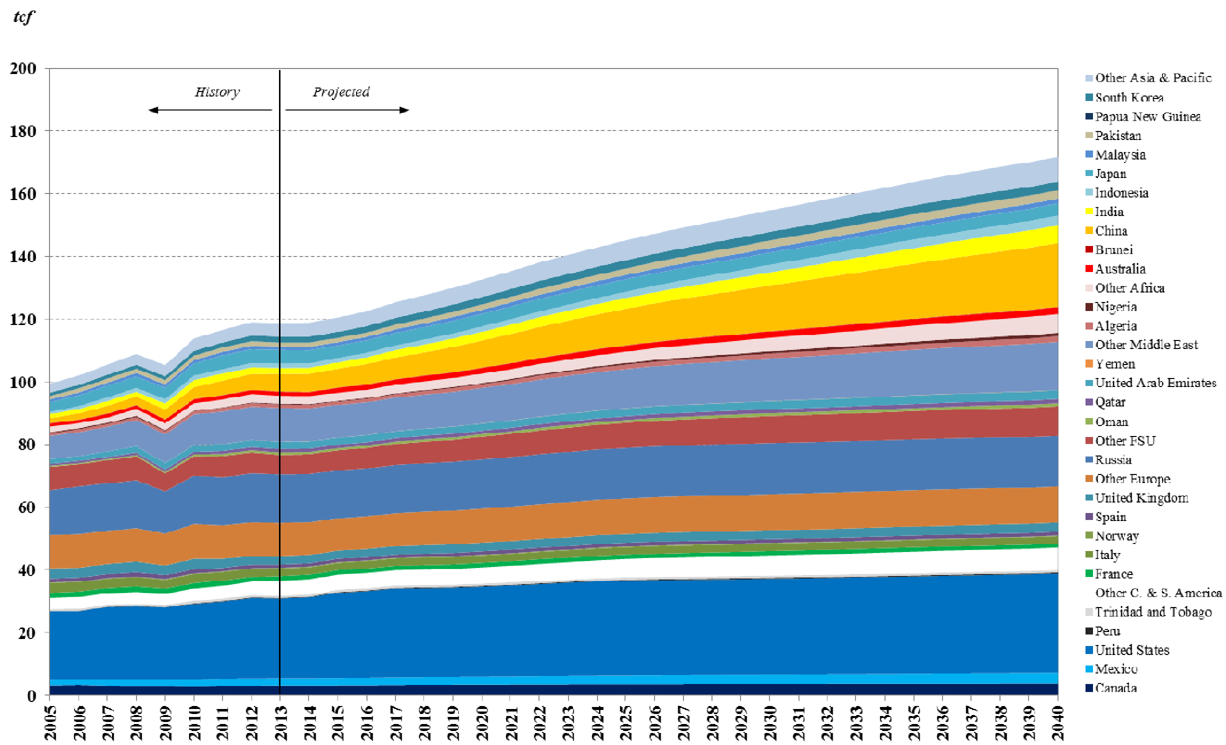
Figure 4. Global LNG Imports by Region (Ref_Ref case)[12]



[11] In the results herein, we aggregate countries into geographically defined regions in order to clearly present the results in a coherent manner. More detailed data is presented in Annex D.

[12] The data for imports is less than the reported export data due to losses in liquefaction and shipping.

Figure 5. Global Demand by Region (Ref_Ref case)



In Figure 5, we see that global demand growth is expected to be fueled primarily by the high population economies of China and India. Europe is not expected to contribute much to the overall global natural gas demand picture, which, in turn, sheds light on the emerging patterns of trade. In particular, as indicated in Figure 5, we see increased flow of LNG to Asia as well as pipeline gas from Russia to Asia (see Figure 6). Long term, the international natural gas trade map is effectively redrawn with a shift in export flows increasingly toward developing Asia.

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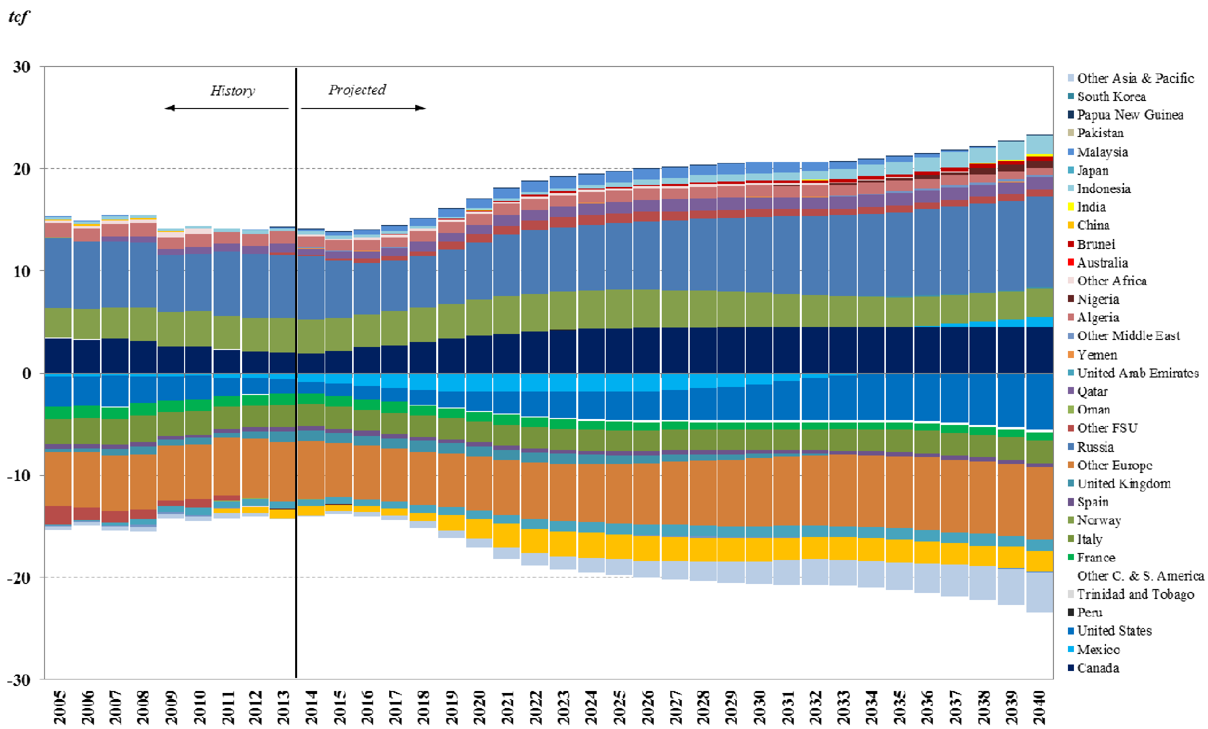
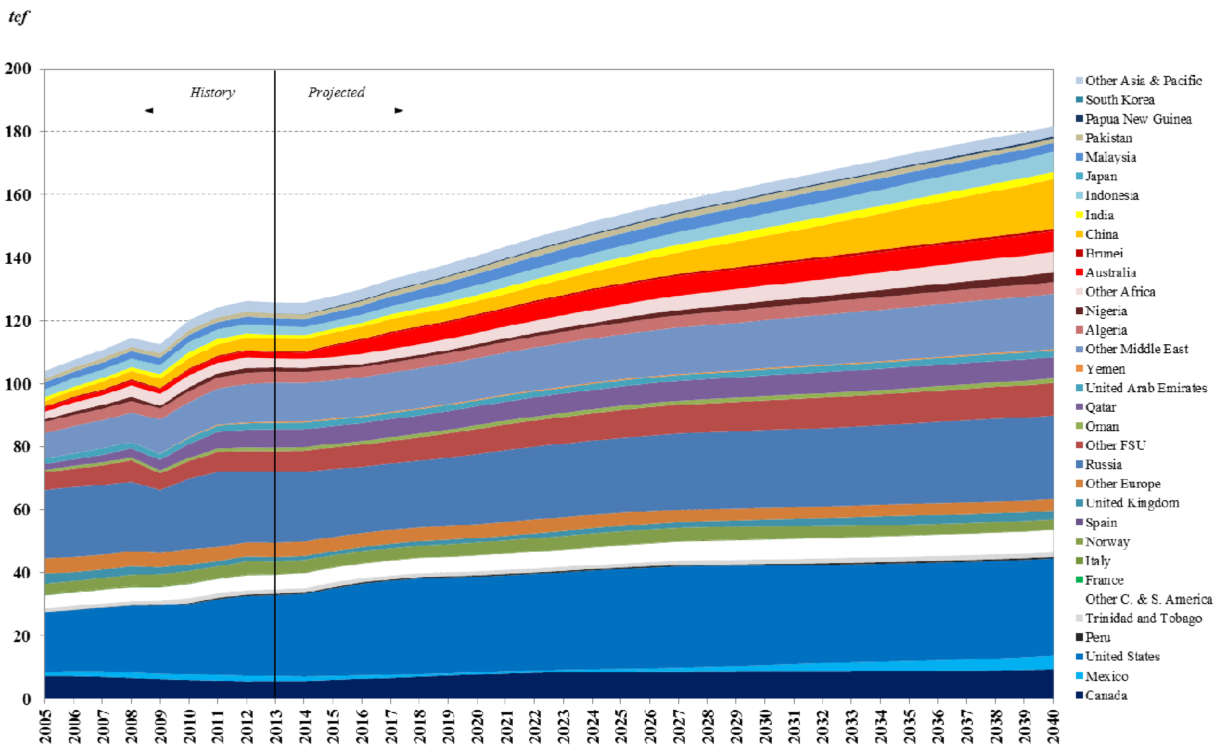
Figure 6. Global Net Pipeline Trade (Ref_Ref case)



As seen in Figure 6, net global trade via pipeline infrastructure is also expected to grow. Announced projects that result in increased pipeline deliveries present attractive options for meeting long-term demand growth, in particular the development of pipelines between Russia and China. In fact, the persistent relatively robust Russian production seen in Figure 7 is largely facilitated by its larger scale entry in the Asian market. A weak demand outlook for Europe (see Figure 6) is not sufficient to support expanded Russian production, hence Russia turns to Asia. More generally, narrowing international price differentials limit the expansion of LNG infrastructure post-2020 and supporting shorter, continental trade via pipeline.

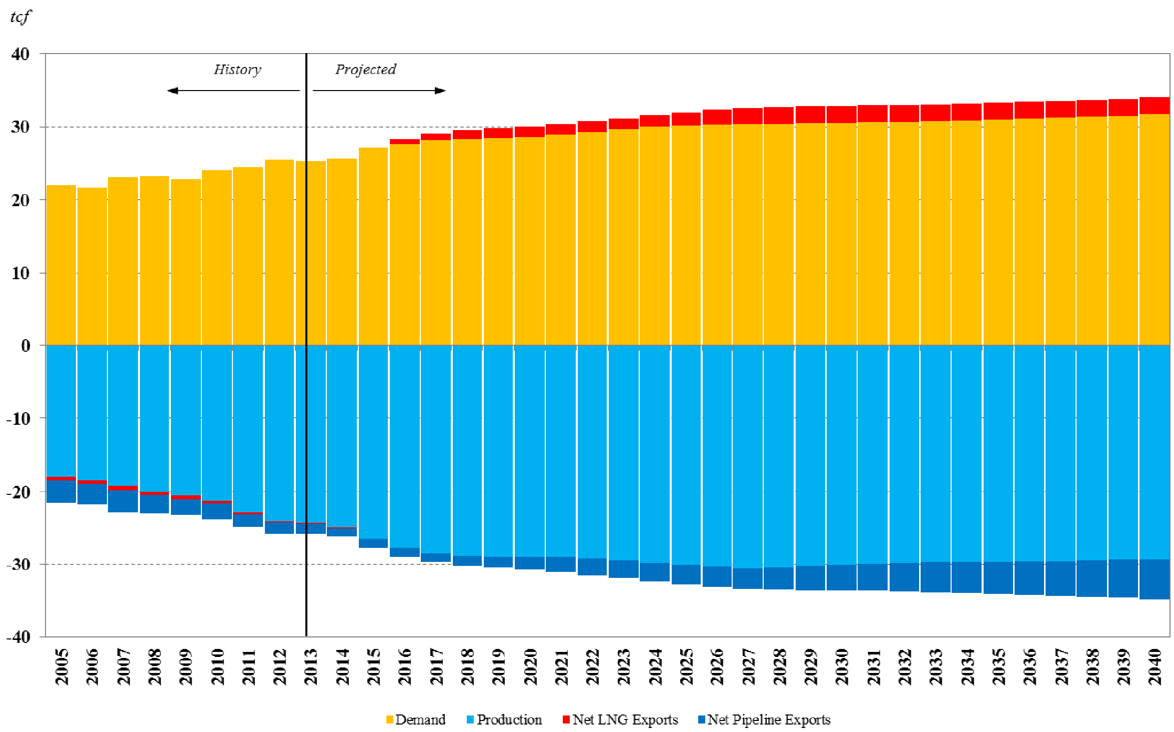
Figure 7. Global Supply (Ref_Ref case)



Also evident from Figure 7 is that Canadian supply expands, fueled primarily by shale gas developments in western Canada. This, in turn, impacts the balance of trade for the United States. As mentioned above, growth in U.S. natural gas production supports LNG exports from the United States of 6.5 Bcf/d, but U.S. LNG exports are also supported by developments in the broader, highly interconnected North American market as the deep interconnectedness of the United States and Canada facilitates the flow of Canadian gas to the United States on already existing infrastructure.

As indicated in Figure 8, Canadian exports via pipeline to the United States increase throughout the time horizon after bottoming out in the early 2010s. The majority of Canadian exports are to western states and the Midwest. Exports to the Mid-Atlantic continue to decline and never recover to any significance, which reflects strong supply growth in the Marcellus shale (see Figure 10).

Figure 8. U.S. Market Balance (Ref_Ref case)



Exports of natural gas via pipeline from the United States to Mexico increase in the near term to about 5.5 Bcf/d in the early 2020s, hold at that level through 2030, then decline through the end of the time horizon as Mexican domestic production begins to climb. The increased connectedness within the North American natural gas market that emerges in the Ref_Ref case reflects a general result that carries significant implications across all scenarios. Namely, Canada, the United States, and Mexico are poised to become more intimately linked through natural gas trade, and, as a result, the impacts of a policy or commercial development in any one country will affect North America more generally.

As indicated in Figures 3 and 8, U.S. LNG exports rise in the Ref_Ref case (and in all cases considered in this study). However, the impact of U.S. LNG exports and other global supply developments on international and domestic prices ultimately places a check on the total volume of U.S. LNG exports. Specifically, the price spreads in the international marketplace weaken to the point that full cost recovery of U.S. LNG export facilities currently under construction is compromised for about a decade. Of course, those facilities operate, but further investment in LNG export capacity is stymied until global demand pull expands to stimulate new capital flows into the U.S. LNG export value chain. Figure 9 highlights the Ref_Ref case price spreads and notes the time periods where price differences are long term supportive of investment in U.S. LNG export capacity.

Figure 9. Price Differentials and LNG Export Capacity Investment (Ref_Ref case)

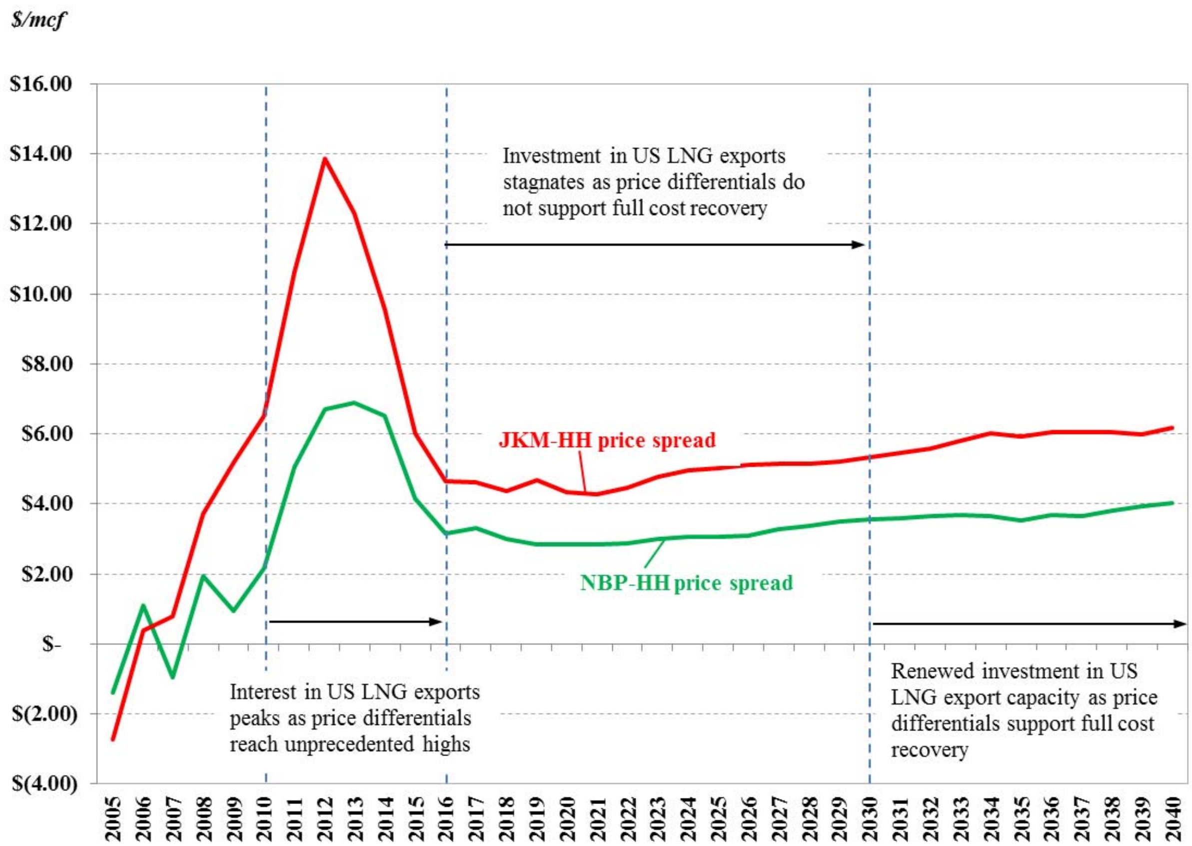
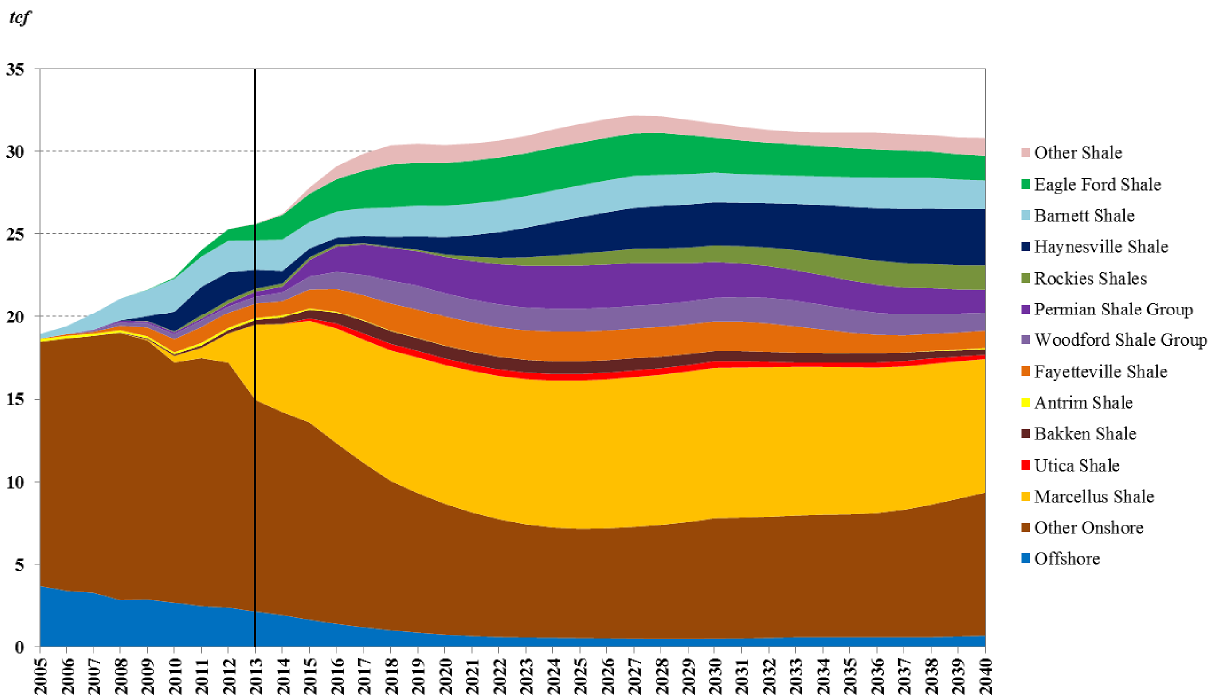


Figure 10 indicates U.S. domestic production by source through 2030. Shale gas production comprises a rising share of U.S. supply, approaching three-quarters of domestic production. The rise in shale production accompanies declines in production from other natural gas resources, both onshore and offshore. The largest producing basin is the Marcellus shale, rising to just over 20 Bcf/d in the late 2020s before beginning to decline. Production from the Haynesville shale is projected to recover in the 2020s due to higher prices and the emergence of a new demand outlet via Gulf Coast LNG export facilities, which attracts upstream capital into northern Louisiana.

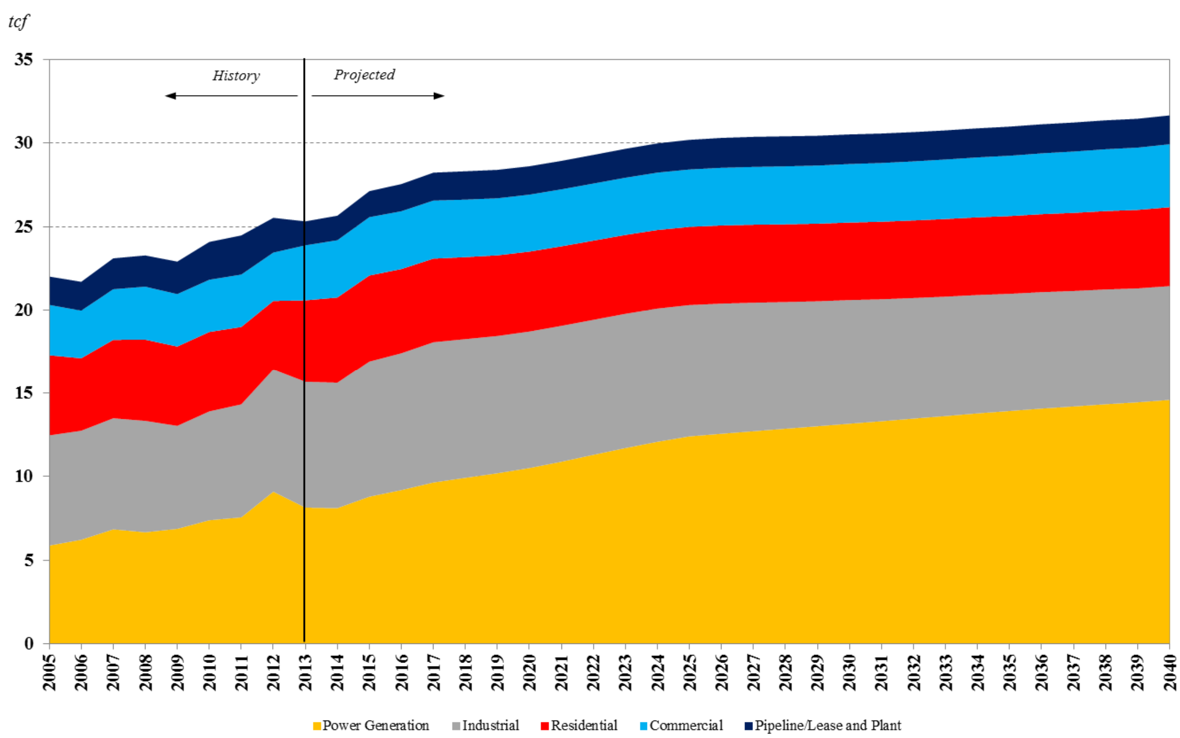
Figure 10. U.S. Supply by Resource and Play (Ref_Ref case)



The projected growth in Canadian production drives an increase in exports via pipeline to the United States, and this occurs as growth in U.S. domestic production flattens. Moreover, Mexican natural gas production begins to increase in the 2020s, meaning total supply throughout the broader North American market is quite robust throughout the time horizon.

Strong North American production facilitates demand growth in the United States, in particular, that is driven by demand in the industrial and power-generation sectors in the near term, and continued growth in power generation longer term (see Figure 11). In fact, the share of natural gas in power generation in the Ref_Ref case is projected to approach 37 percent by 2030, largely driven by emerging environmental policies that target the use of coal. In fact, the power-generation sector is projected to be the most rapidly growing source of domestic demand, rising at an average annual rate of over 3.0 percent through 2020 and 2.3 percent per annum over the entire time horizon. Industrial demand increases at an average annual rate of 2.2 percent through 2020 then is flat to slightly declining after 2020 due to efficiency gains as industrial production continues to increase. The residential and commercial sectors are not projected to see significant growth.

Figure 11. U.S. Demand by End-Use Sector (Ref_Ref case)



The changing U.S. demand and supply portfolio has implications for regional prices. The changing regional price relationships reflect sustained higher levels of production in the Middle Atlantic and Canada longer term, regional patterns of new sources of demand for U.S. natural gas production, such as LNG exports and industrial demands that tend to primarily impact the Gulf Coast, and growth in power-generation demand particularly where coal capacity is retired.[13]

Longer term growth in Canadian production weakens the price in western Canada (AECO Hub) relative to Henry Hub, but price across North America is generally strengthening over time. So, the western Canadian price also strengthens, just more slowly than Henry Hub. In general, the deep interconnectedness of the North American natural gas market and the high degree of fungibility of different sources of natural gas links the prices and in Canada, the United States, and Mexico and prevents any one region from completely dislocating from the other.

3.2 Select Natural Gas Market Highlights Across All Scenarios

In this section, we highlight the differences across cases in prices at Henry Hub, JKM, and NBP. Then, we discuss the differences in U.S. LNG exports across the various scenarios. More detailed results on the changes in domestic and international production and consumption can be found in the Annexes. We focus on these outputs in particular because they form the basis for understanding the impacts on macroeconomic outcomes across the scenarios, which we turn to in section 4.

[13] Note this occurs even with pipeline flow reversals on mainline infrastructure away from the Mid-Atlantic region, which serve to limit the depth to which basis dives longer term.

Figure 12 indicates the price at Henry Hub for each case considered in this study, and Figure 13 indicates the price path of each scenario relative to the Ref_Ref case discussed above. The only two cases not presented in Figure 12 are LNG20_LRR20 and LNG20_Hi-D20. These are not included because they are identical to the scenarios where LNG exports are endogenously determined under the same set of domestic and international market conditions, specifically the LNG20_LRR and LNG20_Hi-D scenarios.

Figures 12 and 13 highlight the breadth of impact on Henry Hub price revealed by the various scenarios. For example, among the cases considered, price is highest in the case where international demand for LNG is highest while domestic resources are lowest (the LNG20_LRR case). Alternatively, price is lowest when international demand for U.S.-sourced LNG is lowest while domestic resources are highest (Ref_HRR). In fact, in moving from Ref_HRR to LNG20_LRR, we see a price spread that approaches $3.60/mcf by 2040. In other words, when international market conditions are such that demand for U.S. LNG exports is at its highest and natural gas resources are relatively scarce, price is considerably higher than when the exact opposite is true.

Figure 12. Henry Hub Price Across Scenarios

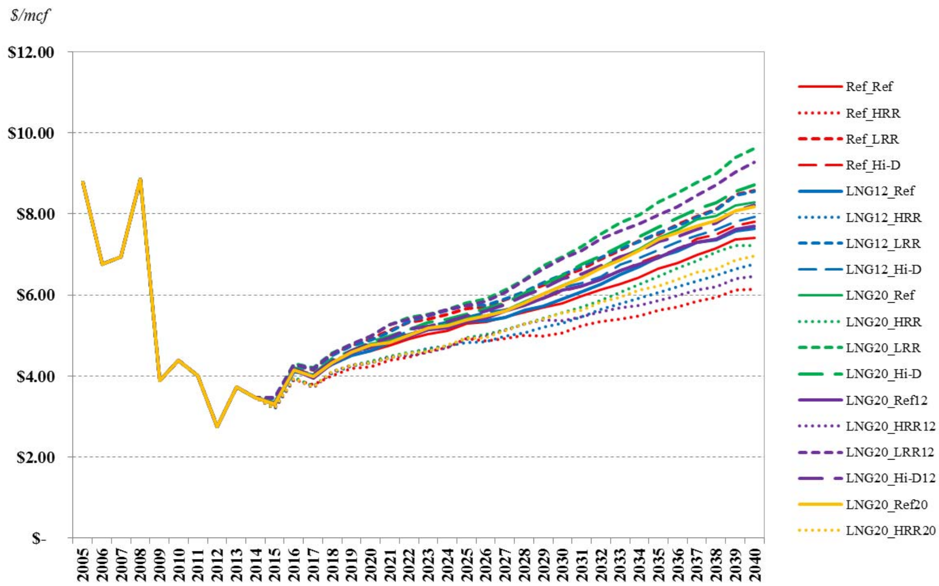
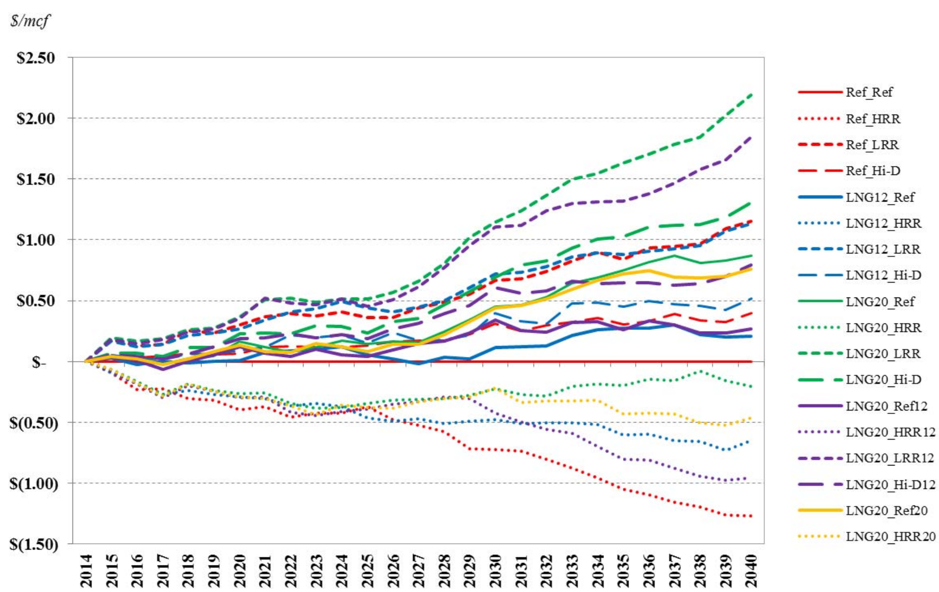


Figure 13. Henry Hub Price Relative to the Ref_Ref Case by Scenario



The other cases collectively reveal a consistent pattern with regard to the Henry Hub price. Namely, as demand for U.S. LNG exports rises, all else equal, the Henry Hub price rises. Moreover, as the availability of U.S. natural gas for export declines, either as resource availability falls or domestic demand rises, the Henry Hub price also rises, all else equal. Therefore, the exact impact of LNG exports on the Henry Hub price depends on both domestic *and* international market considerations. This latter point highlights the basic result that countries become increasingly connected via trade in the Ref_Ref case, and the extent to which this development is reinforced in each scenario plays out in the price at Henry Hub. It also is evident through the manner in which the spreads between Henry Hub and international benchmark prices evolve. Specifically, we see that the spread between Henry Hub and international benchmark prices JKM and NBP narrow as U.S. LNG exports increase within each international demand case, with the majority of the price movement occurring overseas.

Figures 14 and 15 indicate the JKM price and reveal a slightly less diverse picture, but one that is interesting nonetheless. In particular, we see that as international market conditions stimulate greater demand for U.S.-source LNG, the price at JKM rises. This is primarily by construction as the assumptions used to drive up demand for U.S. LNG exports largely target Asia (see Table 2). The price impacts at JKM are exacerbated as U.S. LNG availability is compromised. Notably, the spreads between Henry Hub and JKM (not pictured) are sensitive to both domestic and international drivers. Specifically, we see the spread narrow as more LNG is exported from the United States, all else equal. We return to this point in section 4, but note that the result reinforces the notion that markets become increasingly connected via trade as price signals transmit market information across every region.

Figure 14. JKM Price Across Scenarios

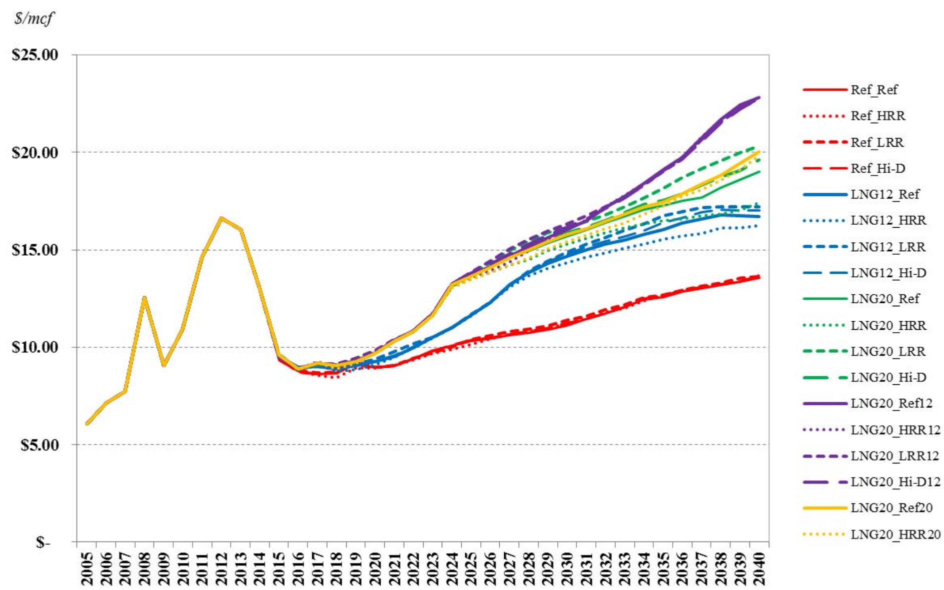


Figure 15. JKM Price Relative to the Ref_Ref Case by Scenario

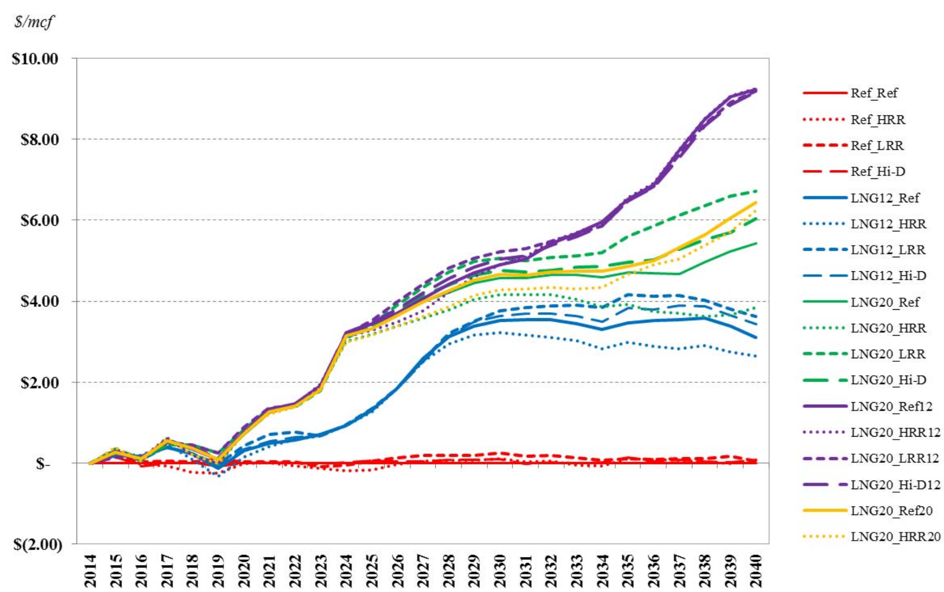


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Figure 16. NBP Price Across Scenarios

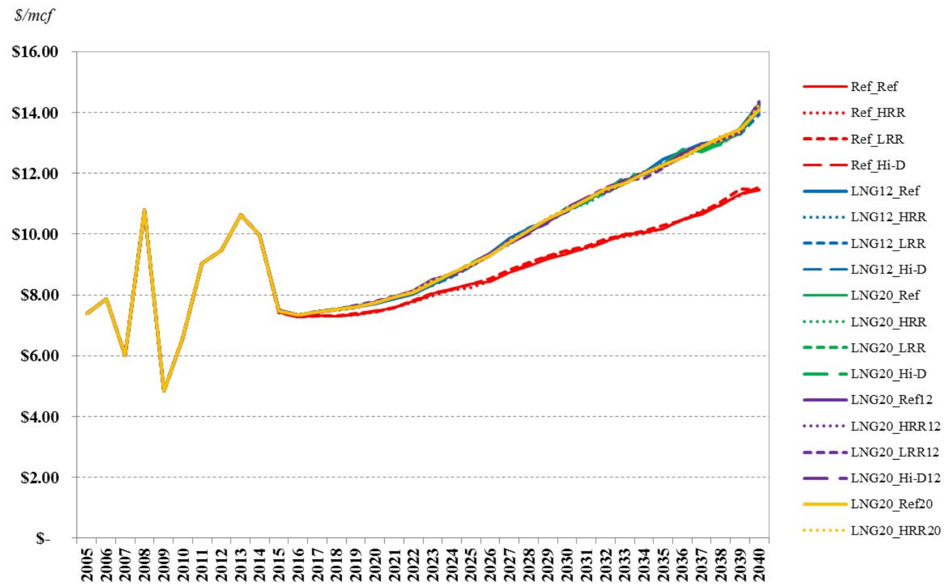
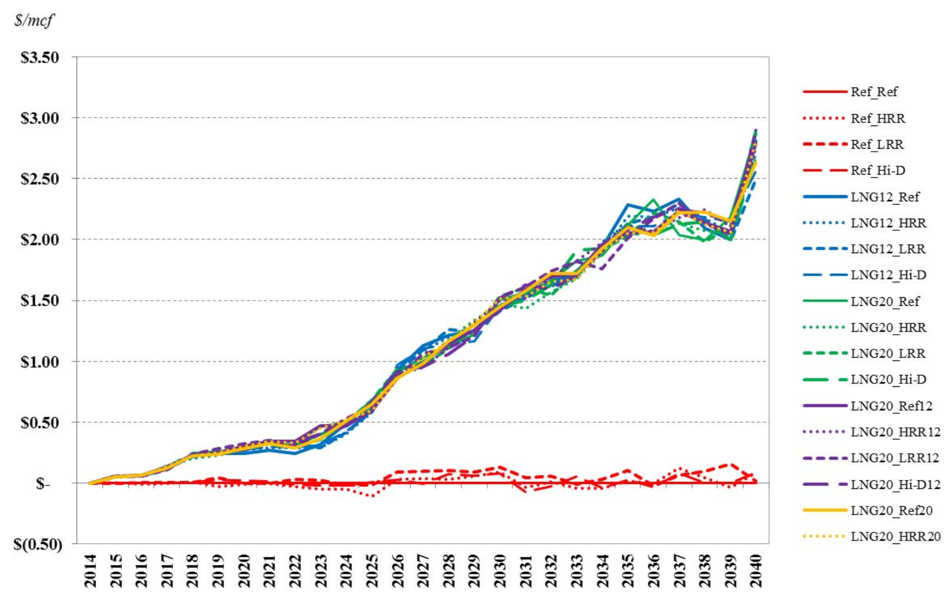


Figure 17. NBP Price Relative to the Ref_Ref Case by Scenario



Figures 16 and 17 detail the pricing results at NBP across the cases. Generally, we see that price is higher in Europe when international market conditions are such that demand for U.S. LNG exports rises. Interestingly, whether or not the increase is to 12 Bcf/d or 20 Bcf/d does not have a significant bearing. This follows because the marginal source of supply to Europe is unchanged beyond the LNG12 international market scenarios and the outlook for total natural gas demand growth in Europe is meager in every case we considered. Thus, the primary sources of supply to northern Europe remain Russia, the North Sea, and LNG primarily from Africa and the Middle East. The price impact is thus driven almost exclusively by deviations in the global LNG market, with modest offsetting responses from traditional pipeline sources of supply, including Russia.

The signal for investments in U.S. LNG export capacity is ultimately contained in the price spreads that emerge across scenarios. Figures 18 and 19 detail the price spreads that are seen between JKM and Henry Hub and NBP and Henry Hub, respectively. The pattern noted above in Figure 9 generally holds across all scenarios. In particular, the global LNG market enters into a period of time where it is relatively well-supplied after 2015. This, in turn, sees price spreads that narrow, and are supportive of LNG exports from the United States through facilities that are already under construction. However, the price spreads post-2015 are generally not supportive of continued investment in new capacity. The stimulus to invest in U.S. LNG export capacity does generally return across the scenarios albeit at different rates. In fact, the higher global LNG demand plus high domestic resource recovery cases see the strongest support for new U.S. LNG export capacity, emerging as soon as the end of this decade, which is about ten years earlier than we see in the Ref_Ref case.

Figure 18. JKM-Henry Hub Price Spreads Across Cases

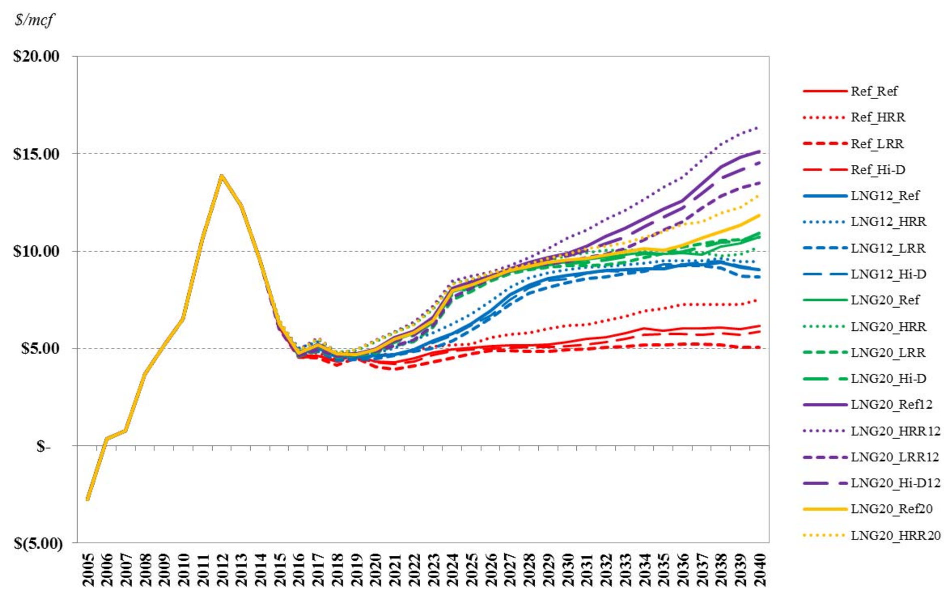


Figure 19. NBP-Henry Hub Price Spreads Across Cases

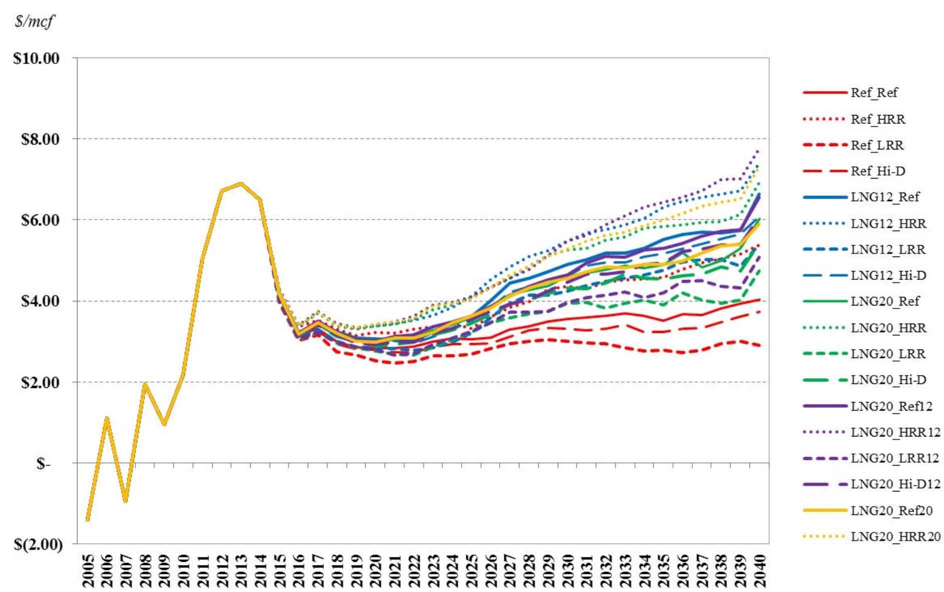
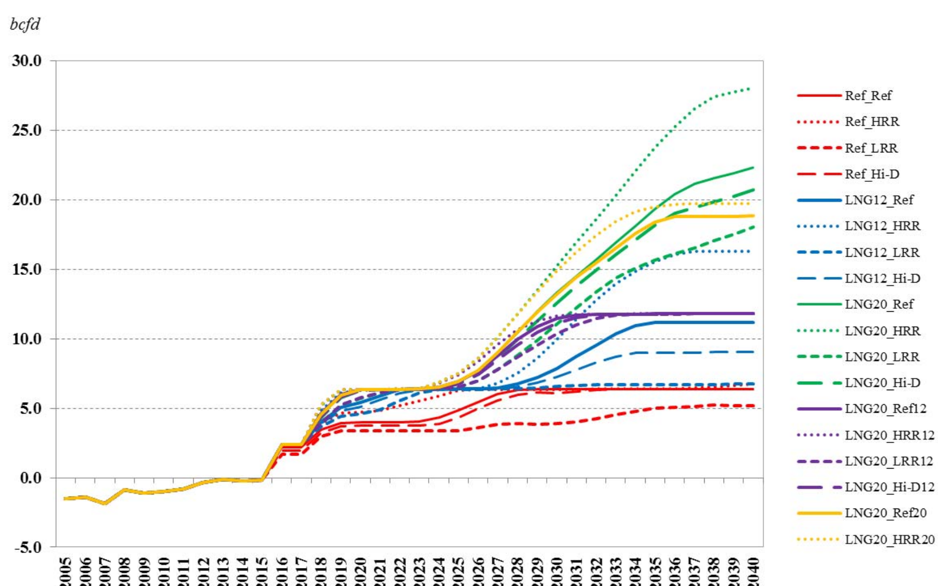


Figure 20 graphs U.S. LNG exports through 2040. Notably, the largest differences emerge after the mid-2020s, a result owing to several factors, including:

- International demand must grow to stimulate investment from new sources of supply. This takes time and generally accompanies economic growth.
- There are a number of planned LNG and pipeline export projects around the world that are already under construction. Thus, absent a very large demand impulse, as in the LNG20 cases, the expansions already underway are sufficient to sate demands for the near term.
- Inhibiting shale resource availability, as in the international LNG12 and LNG20 cases, does not have a material short-term impact because those resources are generally not significant sources of supply even in the international Reference cases until the mid-2020s anyway. So, the supply impact is only felt in the long run.

Figure 20. U.S. LNG Exports Across Scenarios



We see in Figure 20 that the level of U.S. LNG exports approaches 27 Bcf/d in the LNG20_HRR case, which is by far the most aggressive result among the scenarios. This follows from the fact that international market conditions are the most conducive to create demand pull for U.S.-sourced LNG in this case, and the long-term U.S. supply picture is also the most robust. In effect, the international stimulus to total demand for U.S.-sourced natural gas can be met by a very robust supply portfolio.

Table 3. U.S. LNG Exports in 2040 Across Cases (Bcf/d)

International Demand Scenarios		Domestic Scenarios: Reference	High Resource Recovery	Low Resource Recovery	High Natural Gas Demand
Reference		6.38	6.74	5.20	6.36
Global Demand for U.S. LNG Supports 12 Bcf/d		11.18	16.30	6.73	9.02
Global Demand for U.S. LNG Supports 20 Bcf/d	U.S. LNG Exports 12 Bcf/d	11.81	11.82	11.80	11.81
	U.S. LNG Exports 20 Bcf/d	18.82	19.74	*	*
	U.S. LNG Exports Endogenous	22.34	28.05	18.02	20.37

Table 3 indicates the level of U.S. LNG exports in 2040 for every case we considered. The results indicate that the largest driver of change in U.S. LNG exports for a given international market circumstance (or reading across Table 3) is domestic resource availability. It is also evident that for a given domestic scenario (or reading vertically in Table 3), different international market conditions have larger impacts on U.S. LNG export volumes than any of the domestic scenarios we considered.

This highlights the importance of considering the issue of U.S. LNG exports in the context of a global analysis. This point is made even more salient when considering the competiveness of natural gas-consuming industries across countries in a broader macroeconomic framework. We turn to this next.

4 Macroeconomic Impact of Increased U.S. LNG Exports

When comparing the macroeconomic outcomes of different LNG export levels it is important to do so against a clear point of reference. Therefore, we detail the macroeconomic outcomes by comparing cases where international market conditions are held constant as the level of U.S. LNG exports increases. In this section, we focus on the cases where the international market supports more than 20 Bcf/d of demand for U.S. LNG exports. We first present a detailed discussion of the results for the Reference domestic scenario (that is, we compare the LNG20_Ref12, LNG20_Ref20, and LNG20_Ref cases) in order to gauge the effect of increasing U.S. LNG exports above 12 Bcf/d. We then assess whether conclusions drawn from the Reference domestic case hold for the alternative domestic cases—High Resource Recovery (HRR), Low Resource Recovery (LRR) and High Gas Demand (Hi-D).

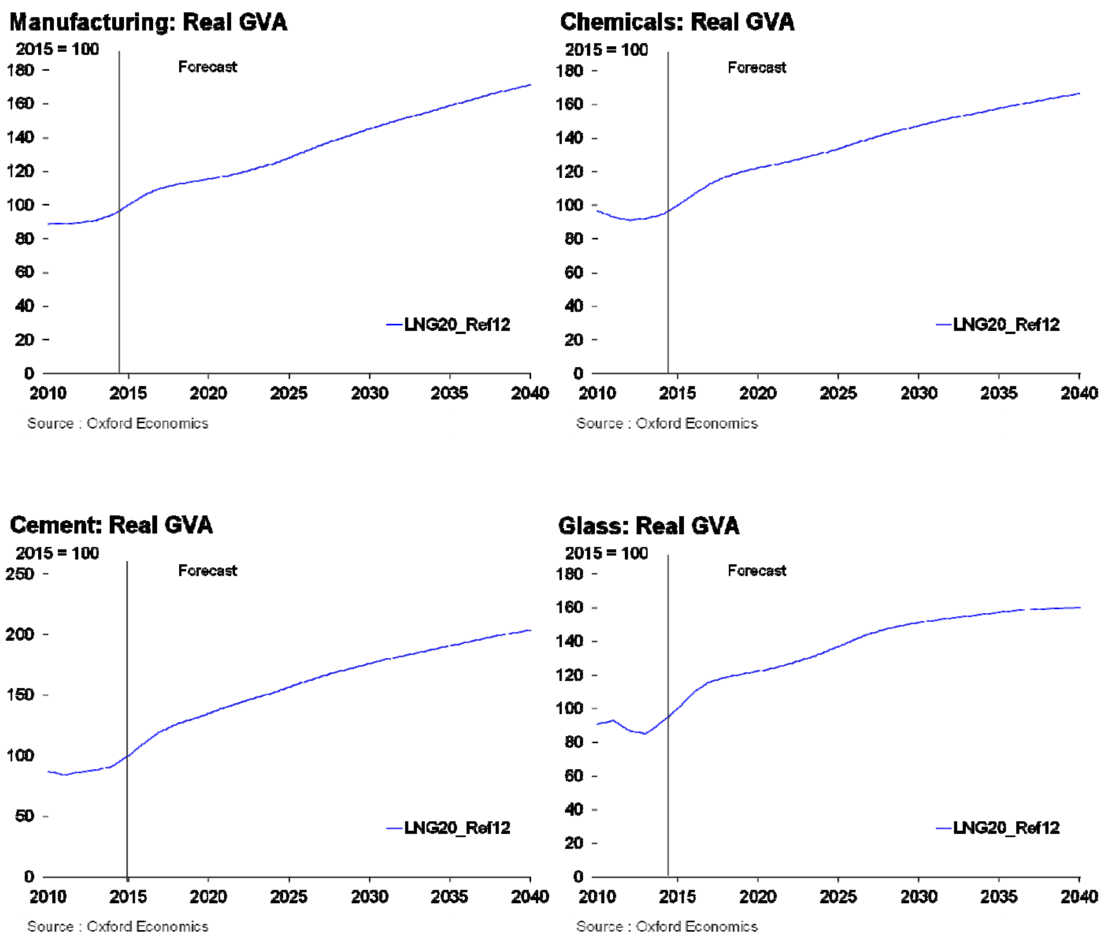
The key assumptions driving the LNG20_Ref12 case (that is, where international demand supports 20 Bcf/d of U.S. LNG exports but capacity does not exceed 12 Bcf/d in the Reference domestic scenario) are as follows:

- As discussed in section 2, in order to ensure international demand is sufficient for 20 Bcf/d of U.S. LNG exports, it is assumed accessible shale resources outside the United States are extremely limited relative to the Ref_Ref case. Total accessible shale resources outside the United States are assumed to be 2,713 tcf, compared with 7,578 tcf in the Ref_Ref scenario. In addition, it is assumed that several large coal-consuming countries, including China, India, Indonesia, and South Korea, reduce coal consumption to limit CO_2 emissions.

- The spread between European and Asian benchmark prices and the Henry Hub price are substantially higher than in the baseline (Ref_Ref) scenario. This follows from diminished supply capabilities outside the United States and ultimately drives an increase in U.S. LNG exports.
- In the LNG20_Ref12 case U.S. GDP growth continues to expand at around 2.6 percent per year on average to 2040.[14] U.S. manufacturing growth continues to expand strongly. Despite higher Henry Hub prices, energy-intensive sectors (EIS) such as chemicals, cement, and glass continue to grow robustly (see Figure 21). Key sectors, such as construction and motor vehicles, continue to drive output in the glass and cement sectors as well as parts of the chemicals sector.

[14] This projection is derived by imposing modeled natural gas market conditions (production and export volumes and prices) on the Ref_Ref baseline. U.S. GDP growth in the Ref_Ref case is based on the EIA 2014 Annual Energy Outlook.

Figure 21. Manufacturing Outlook in LNG20_Ref12 Scenario



Given this backdrop, we compare scenarios in which:

- U.S. LNG exports rise from 12 Bcf/d to a maximum of 20 Bcf/d (that is LNG20_Ref12 vs. LNG20_Ref20).
- U.S. LNG exports rise from 12 Bcf/d to a market-determined level that exceeds 20 Bcf/d (that is LNG20_Ref12 vs. LNG20_Ref).

The rest of this section examines the impact of the scenarios for the natural gas market and the U.S. economy.[15] We begin with a detailed discussion of the results when increasing exports to 20 Bcf/d in the Reference domestic scenario, and then subsequently discuss the impacts in the alternative domestic cases. We then review the impacts of allowing exports to rise to their market-determined level.

4.1 U.S. LNG Exports Increase from 12 Bcf/d to 20 Bcf/d

4.1.1 Natural Gas Market Impacts

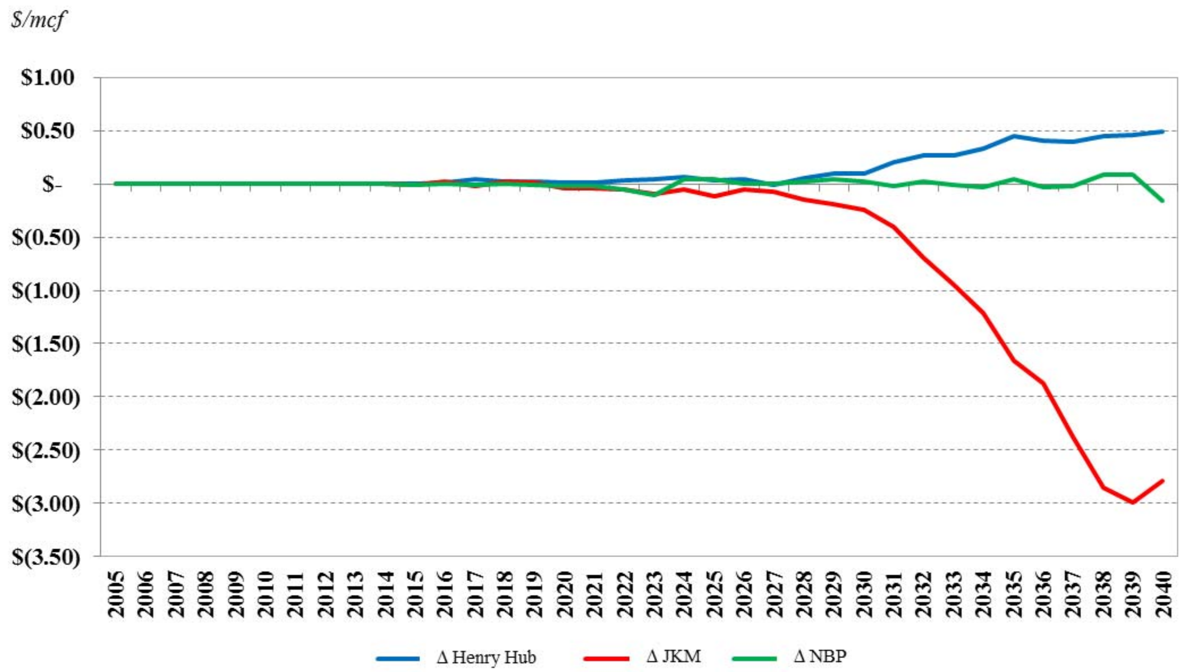
In this section, we highlight the scenarios where international market conditions are supportive of 20 Bcf/d of U.S. LNG exports under the Reference domestic scenario. We begin with the scenario where LNG exports from the United States do not exceed 12 Bcf/d (LNG20_Ref12). Then, we compare this to the case where LNG exports can rise to a maximum of 20 Bcf/d (LNG20_Ref20).

Exports of natural gas overall rise 26 percent, pushing net LNG exports from the United States to 4 Bcf/d from 0.3 Bcf/d in the lower export case. At an aggregate level, the impact on exports, however, is limited, with net fuel exports rising just 0.02 percent of GDP

As indicated in Figure 22, the Henry Hub price rises as LNG exports increase to 20 Bcf/d, while other international benchmark prices decline. This is the result of allowing increased trade from the United States thereby serving to relax the highly constrained supply situation internationally.

[15] Scenario results from the GEM and GIM are presented through 2040, with the focus of analysis covering the period 2026–2040. This is done to highlight the differences across cases. Namely, as indicated in the discussion of the natural gas market results in the previous section, the majority of the differences across scenarios occur after the mid-2020s. Results for the period 2015–2040 and 2015–2025 are given in the Annex. Detailed results for all other modeled scenarios are also available in Annex.

Figure 22. Change in Global Gas Prices (LNG20_Ref20 minus LNG20_Ref12)



Notably, the price response in Asia tends to be greatest as U.S. LNG exports rise to 20 Bcf/d. The JKM price declines in dollar terms by an amount that is roughly six times greater than the price increase at Henry Hub. This is the result of the international market conditions that are simulated in the LNG20 cases. In particular, the LNG demand stimulus is primarily the result of highly constrained supply potentials plus higher demand in Asia. While shale potential is also constrained in Europe in the LNG20 cases, the change relative to the Reference international case is small compared to the change in Asia. In addition, demand is not stimulated in Europe to the same extent as in Asia because the Reference international scenario already assumes policies are in place to reduce CO_2 emissions in Europe. As a result, the European market is simply not as stressed as the Asian market in the LNG20 cases and thus has less to gain from increased availability of U.S. LNG exports.

Figure 23. U.S. Supply by Resource and Play (LNG20_Ref12 case)

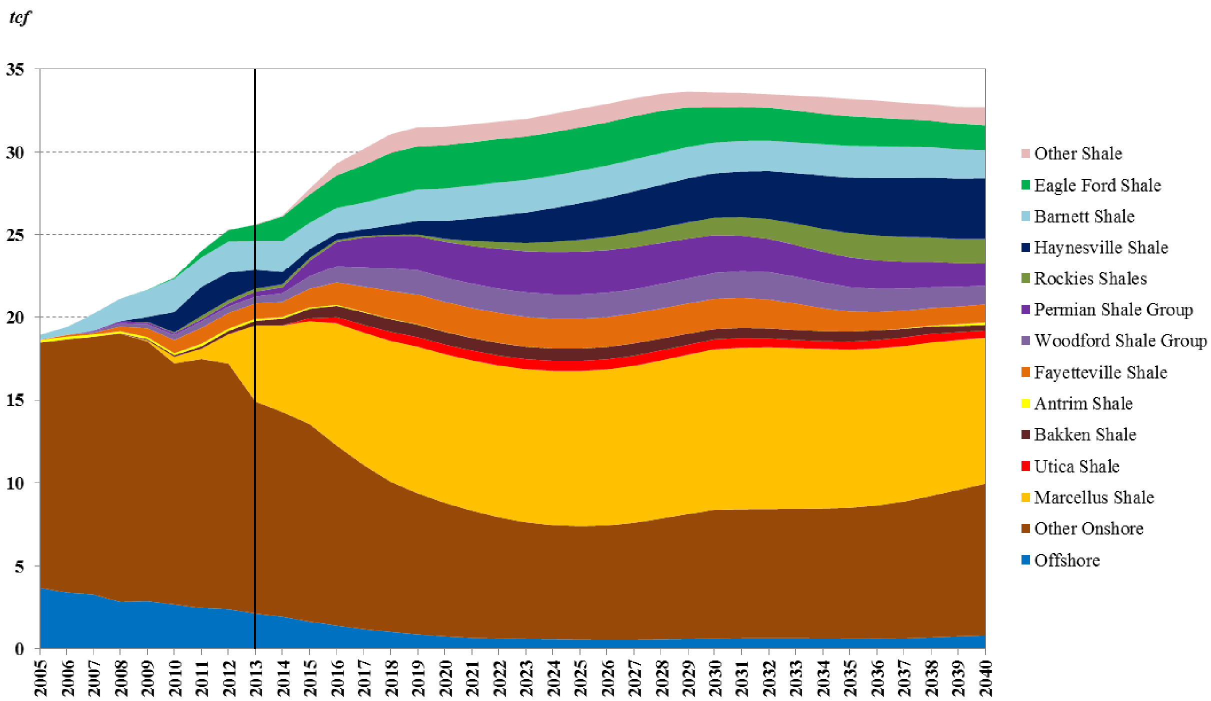
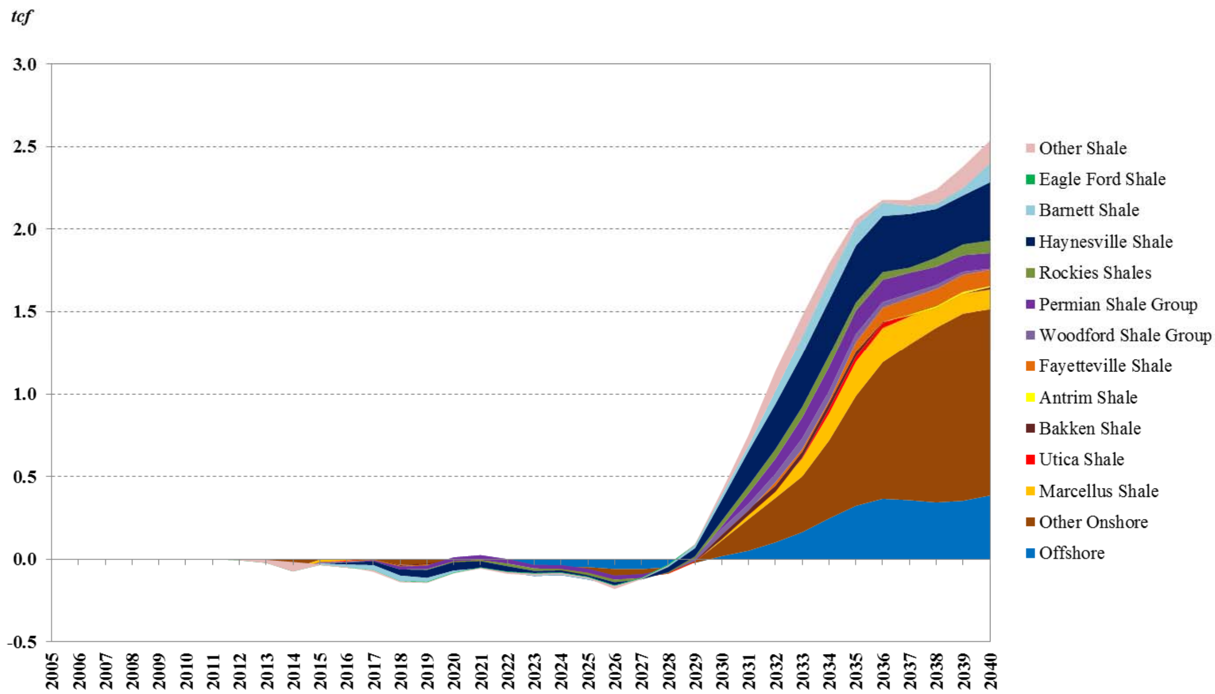


Figure 23 shows that domestic production rises to well over 30 tcf per year by 2030 even when exports are constrained at 12 Bcf/d. While the maximum is only slightly higher than in the Ref_Ref case discussed above in section 3, exports to Mexico via pipeline (not pictured) are lower longer term, which indicates a redirection of supply when international demand pull is greater.

Figure 24. Change in U.S. Production (LNG20_Ref20 minus LNG20_Ref12)



In Figure 24, we see that U.S. production continues to increase through the time horizon when LNG export volumes can expand to 20 Bcf/d, rising 4 percent on average from 2026–2040. Greater LNG exports effectively serve as additional demand for U.S. natural gas, which facilitates additional expansion in the domestic upstream sector.

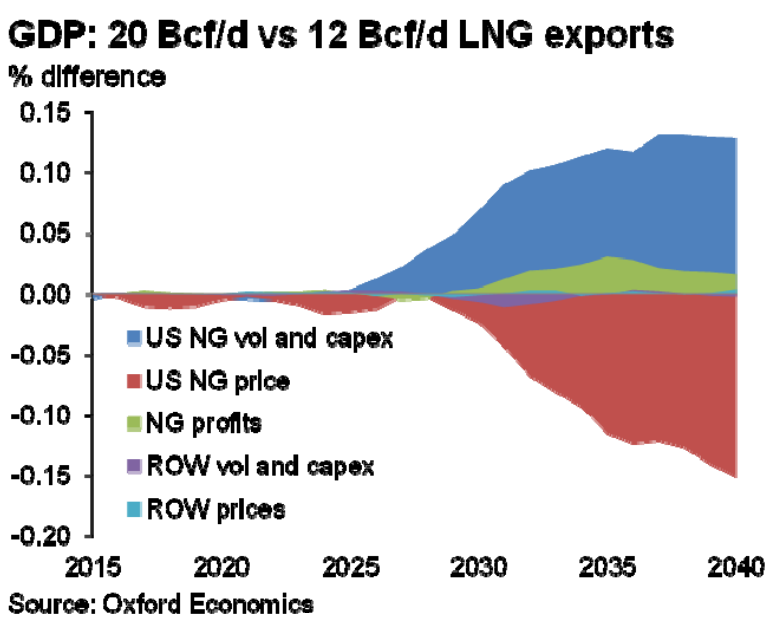
Of course, there are offsetting impacts, but these are relatively small. The majority of the increase in LNG exports is accommodated by expanded production rather than reductions in domestic demand, which declines by about 450 mmcf/d by 2040 with the bulk of the impact split evenly across the power generation and industrial sectors. This fact that the price increase as we move from 12 Bcf/d to

20 Bcf/d of LNG exports slowly climbs to $0.50 by 2040 renders the domestic demand response to be relatively small.

4.1.2 Macroeconomic Impacts in the Domestic Reference Case

The macroeconomic impacts of increasing U.S. LNG exports to 20 Bcf/d from 12 Bcf/d can be decomposed into five main channels identified in section 2.2. When decomposing impacts of greater LNG exports by channel (see Figure 25), the gains from incremental natural gas production and investment in the higher export cases are generally offset to a significant extent by greater increases in U.S. natural gas prices. While U.S. natural gas producers see greater profits, the gains are small relative to the economy as a whole.

Figure 25. GDP Impact by Channel, 20 Bcf/d vs. 12 Bcf/d LNG



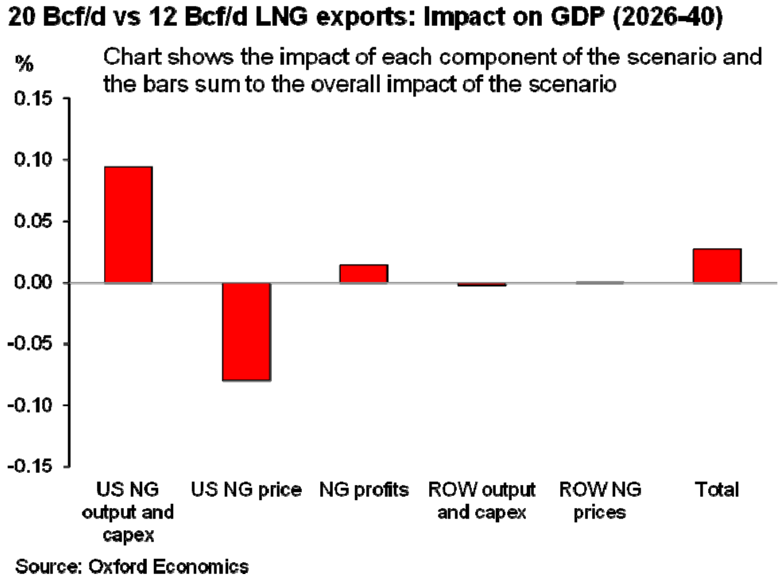


Table 4. Key Scenario Drivers, 12 Bcf/d vs. 20 Bcf/d of LNG Exports (2026–2040 average)

Channel	Indicator	Key Inputs		Change (% or ppts)
		12 Bcf/d	20 Bcf/d	
U.S. LNG Production and Investment	NG production (Bcf/d)	94	97	4.0%
	NG consumption (Bcf/d)	93	93	0.1%
	NG exports (Bcf/d)	17	21	26%
	NG imports (Bcf/d)	16	17	4.2%
	Net fuel exports (% of GDP)*	–	–	0.02%
	Capex (% of GDP)*	–	–	0.06%
U.S. Gas Price	Henry Hub price (2010$/mmBtu)	$6.59	$6.87	4.3%
U.S. Energy Sector Profits	Profits (% of GDP)	0.04%	0.07%	0.03%
Rest of World LNG Production and Investment	Capex (% of GDP)*	–	–	0.00%
Rest of World Gas Prices (2010$/mmBtu)	NBP (UK)	$11.67	$11.68	0.0%
	German Border (NW Europe)	$11.16	$11.16	0.1%
	JKM (Asia-Pacific)	$18.13	$16.89	-6.8%

*Only the change in the value is available and this is applied to more aggregated data

The key drivers of these results are highlighted in Table 4 and are detailed as follows:

- **U.S. LNG Production and Investment**: When U.S. LNG exports rise to 20 Bcf/d from 12 Bcf/d, natural gas production is 4.0 percent higher in the domestic Reference case. This is associated with a rise in net fuel exports of just 0.02 percent of GDP over the period 2026–2040 and additional investment of 0.06 percent of GDP. There are positive multipliers from the extra production and investment, as activity is stimulated in the rest of the economy, and as a result total output is 0.1 percent higher from 2026–2040.
- **U.S. Natural Gas Prices**: The Henry Hub price is, on average, 4.3 percent higher in the 20 Bcf/d export case than the 12 Bcf/d case over the period 2026–2040. As noted above, higher gas prices dampen domestic consumption and erode U.S. export competitiveness. In total, higher prices reduce GDP by 0.1 percent over the period 2026–2040.
- **U.S. Profits**: Profits in the 20 Bcf/d export case are higher given the rise in prices, production and export volumes, but the scale of the impact is small relative to the size of GDP. Profits are 0.03 percent of GDP higher in the 20 Bcf/d case compared with the 12 Bcf/d case. The rise in profit is also modest because it is assumed U.S. producers receive the Henry Hub price on LNG exports rather than the price in the destination market. It assumed that 95 percent of profits are distributed to households and this results in a marginal increase in consumption and GDP over 2026–2040.
- **Rest of World NG Production and Investment**: Production in the rest of the world is little changed when U.S. LNG exports increase to 20 Bcf/d from 12 Bcf/d; international demand conditions remain unchanged, and the addition of incremental U.S. LNG exports displaces very

little supply from the rest of the world. As result, capex needs by the gas sector in the rest of the world remain broadly unchanged when the United States increases LNG exports.

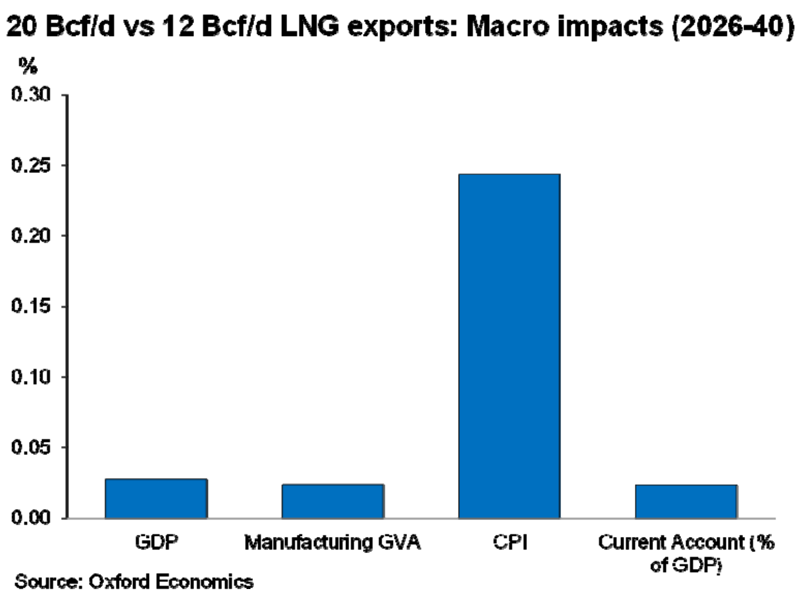
- **Rest of World NG Prices**: The increase in the availability of cheaper U.S. gas exports on the world market dampens NG price increases in Asia, though prices in Europe are little affected. The marginal decline in NG prices both boosts real income in the rest of the world—which boosts demand and is positive for U.S. exports—and boosts the competitiveness of Asian firms relative to U.S. companies, which is negative for U.S. exports. However, the small impact on gas prices and the relative unimportance of natural gas to total energy supply in Asia means that the impact on consumption in Asia is limited as is the competitiveness boost enjoyed by Asian firm from lower gas prices. As result, the overall impact on U.S. GDP through this channel is limited.

The overall macroeconomic impacts of increasing U.S. LNG exports to 20 Bcf/d from 12 Bcf/d are small, reflecting the small size of the shocks relative to the economy overall. In aggregate the size of the economy is little changed in the long run, with GDP less than 0.1 percent ($7.7 billion USD annually in today's prices) higher on average over 2026–2040 than in the 12 Bcf/d export case (see Figure 26).

The United States' current account position is also little impacted by the increase in LNG exports. This is because changes in net exports of LNG are small relative to the size of the economy, and Henry Hub prices are also only modestly higher when the U.S. exports more LNG.

The increase in natural gas prices following an increase in U.S. LNG exports is reflected in a slight increase in the average level of consumer prices, which are 0.25 percent higher on average in the higher export case over the period 2026–2040. However, as this impact is spread over a number of years, so the impact on average inflation is negligible. This modest rise in price level squeezes back some consumer spending and erodes U.S. competitiveness.

Figure 26. Macroeconomic Impact of Increasing LNG Exports to 20 Bcf/d from 12 Bcf/d



At the sector level, firms that supply the natural gas sector and are involved in developing the infrastructure and supply chains needed to increase production and LNG exports benefit. This includes firms in the construction and engineering sectors.

Higher natural gas prices in the United States associated with greater U.S. LNG exports are negative for the energy-intensive manufacturing sectors (see Figure 27), and some sectors—such as glass, cement, and chemicals[16]—see small declines in output (see Figure 28). These are outweighed by gains in manufacturing industries that benefit from increased investment in the natural gas sector and increased construction activity, such as metals, as well as industry gains attributable to the increase in overall demand (i.e., consumer products, food, etc.). As a result, the manufacturing sector in aggregate is little impacted.

Some sectors such as cement and metals are both energy intensive and construction dependent and their relative exposure to these two factors determines whether or not they benefit from an increase in U.S. LNG exports. However across sectors the overall impacts of greater LNG exports are small compared with the expected growth in sector output through 2040.

[16] It should be noted that the analysis does not account for the potential impacts of higher natural gas production on the production of natural gas liquids (NGL) and the potential impacts of changes in NGL production on the domestic petrochemicals industry. The increase in shale gas production in recent years has been associated with a similar rise in NGL production and a decline in prices, which has benefitted the U.S. petrochemical sector (see, for instance, *U.S. NGLs Production and Steam Cracker Substitution*, Oxford Institute for Energy Studies, September 2014). As such it is possible that the increase in gas production associated with rising exports could provide further benefit to the sector and output overall.

Figure 27. EIS vs. Non-EIS Value-Added, 20 Bcf/d vs. 12 Bcf/d of LNG Exports[17]

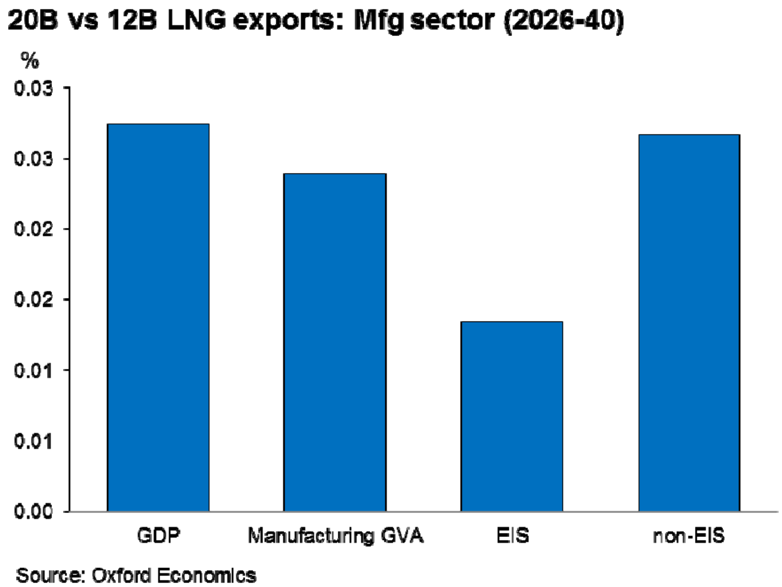
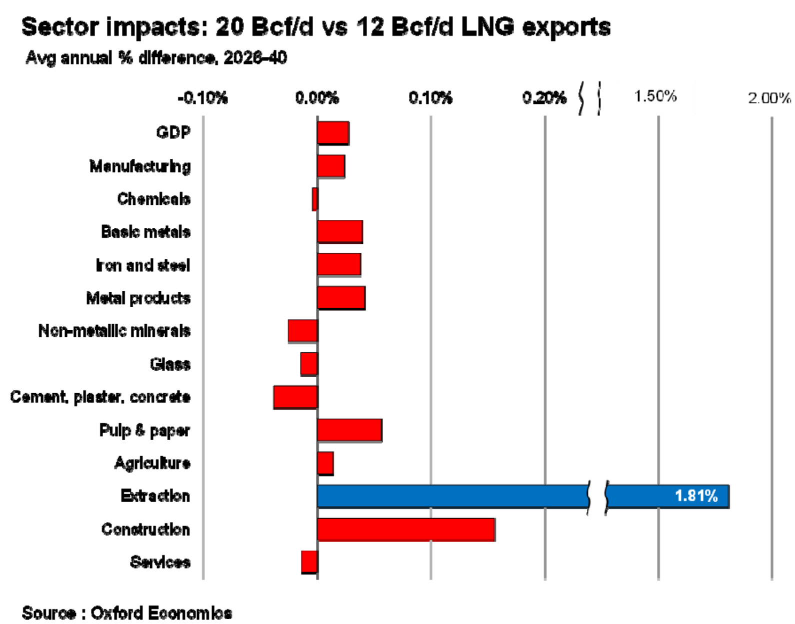
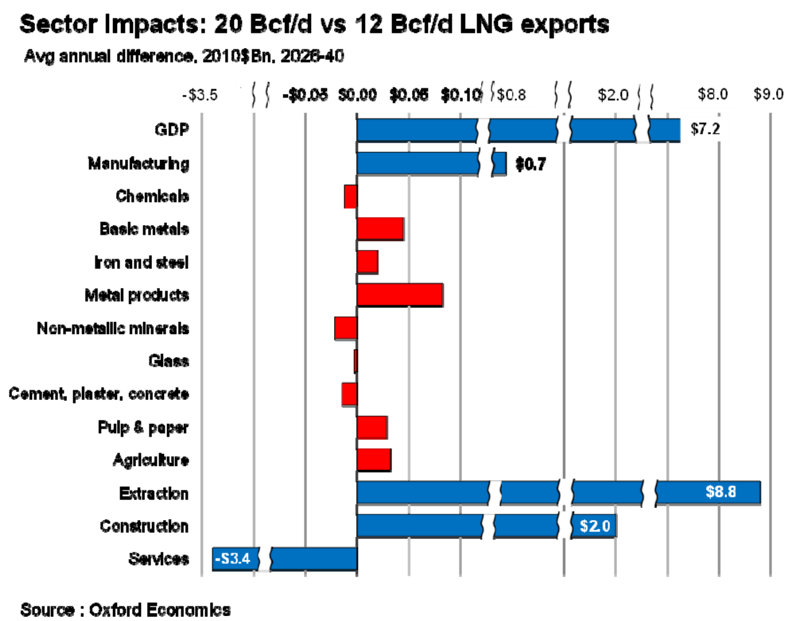


Figure 28. Sector-Level Impacts, 20 Bcf/d vs. 12 Bcf/d LNG Exports



[17] EIS includes chemicals, basic metals and metal products, and non-metallic minerals (which includes cement and glass). These sectors are among the most intensive consumers of natural gas per dollar of output.



4.1.3 Macroeconomic Impacts in the Alternative Domestic Scenarios

The section examines the impact of increasing U.S. LNG exports to 20 Bcf/d from 12 Bcf/d (assuming unchanged international demand) in the HRR case and compares the results to increasing U.S. LNG exports in the Reference domestic case. U.S. exports of LNG do not reach 20 Bcf/d in the LRR scenario and are right at that mark in the Hi-D scenario. Thus, these two alternatives are not assessed here, but are in section 4.2, which examines cases of endogenously determined U.S. LNG exports.

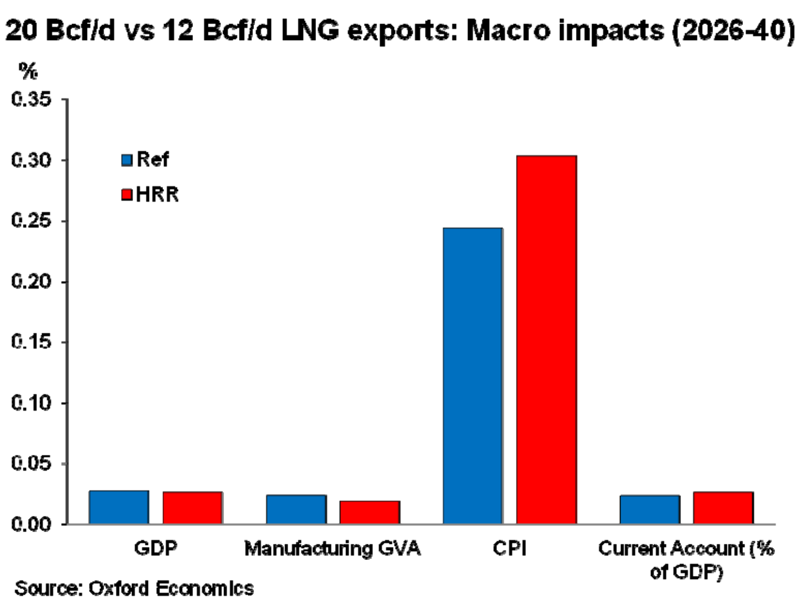
Table 5. Change in Key Scenario Drivers and Scenario Results (2026–2040), 20 Bcf/d vs. 12 Bcf/d LNG Exports Across Domestic Scenarios

	Reference	High Resource
Scenario Drivers		
United States		
NG Production	4.0%	5.1%
NG Consumption	0.1%	0.3%
NG Exports	26%	28%
NG Imports	4.2%	2.4%
Net Fuel Exp. (% of GDP)	0.02%	0.03%
Henry Hub Price	4.3%	4.7%
Capex (% of GDP)	0.06%	0.06%
Profits (% of GDP)	0.03%	0.03%
Rest of World		
Prices:		
NBP (UK)	0.0%	-0.1%
German Border (NW Europe)	0.1%	0.0%
JKM (Asia-Pacific)	-6.8%	-8.4%
Capex (% of GDP)	0.00%	0.00%
Scenario Results		
GDP Change by Channel		
Total	0.03%	0.03%
U.S. NG Output and Capex	0.09%	0.11%
U.S. NG Price	-0.08%	-0.09%
NG Profits	0.01%	0.02%
Rest of World Output and Capex	0.00%	-0.01%
Rest of World NG Prices	0.00%	0.00%
Manufacturing GVA	0.02%	0.02%

Table 5 compares the changes in the key scenario drivers and outputs when LNG exports increase from 12 Bcf/d to 20 Bcf/d in the domestic Reference (LNG20_Ref12 to LNG20_Ref20) and high domestic resource (LNG20_HRR12 to LNG20_HRR20) scenarios. In the HRR scenarios, there is a greater increase in domestic production when LNG exports increase, a result that follows from the assumptions about U.S. resource endowment. In the higher resource case, LNG production is, on average, 5.1 percent higher from 2026 to 2040 when LNG exports increase to 20 Bcf/d compared with 4.0 percent increase in the Reference domestic case. The increase in investment is roughly equal between the two cases, and the impact on domestic natural gas prices is slightly greater when U.S. LNG exports increase in the HRR cases compared to the domestic Reference case.

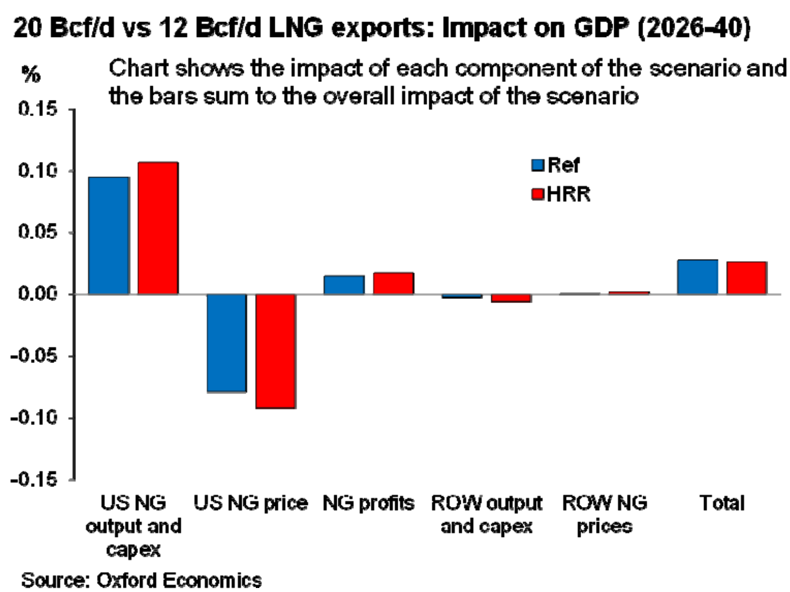
In aggregate, the macroeconomic impacts of increasing export volumes from 12 Bcf/d to 20 Bcf/d in the domestic High Resource scenario are broadly similar to those in the domestic Reference scenario (see Figure 29); GDP is little changed. The higher increase in gas prices has a slightly more pronounced impact on the manufacturing sector. A larger increase in the gas price compared with the reference scenario also results in a bigger impact on the consumer price level and, combined with a slightly larger increase in net gas exports, a slightly larger positive impact on the current account.

Figure 29. Macroeconomic Impacts of Increasing LNG Exports to 20 Bcf/d from 12 Bcf/d in the Domestic Reference and High Resource Scenarios, 2026–2040



Breaking down the results across the different impact channels (see Figure 30), the increase in production and export volumes are slightly higher in the High Resource case, leading to a marginally larger direct impact of rising output in the natural gas sector. However, the increase in prices as LNG exports rise is also slightly larger in the High Resource case, leading to a slightly larger negative macroeconomic impact from this channel. The increase in profits as a share of GDP in each case is the same.

Figure 30. GDP and Manufacturing Sector Impacts, 20 Bcf/d vs. 12 Bcf/d LNG Exports in the Domestic Reference and High Resource Scenarios



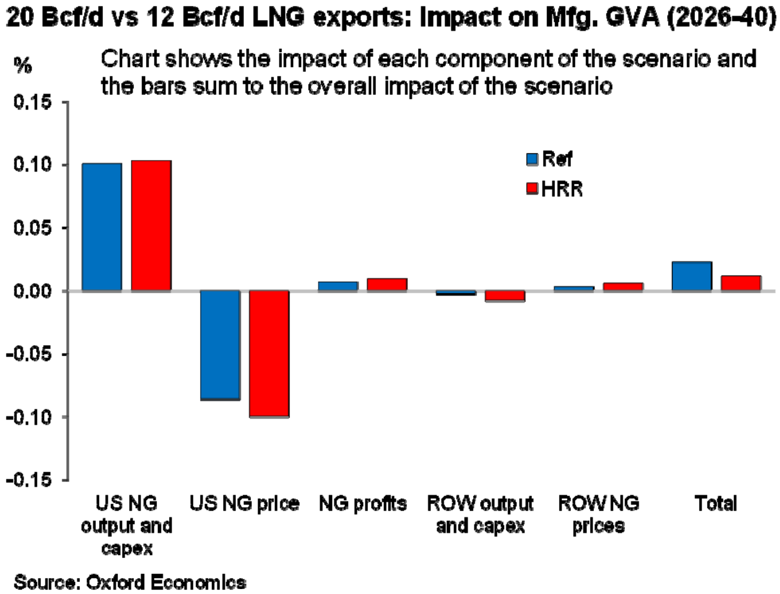


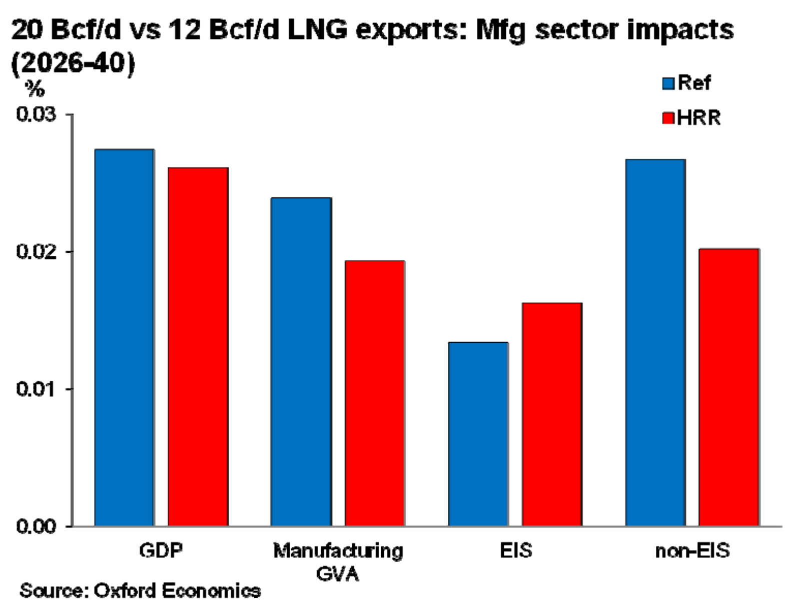
Table 6. Change in Sector Value-Added (2026–2040), 20 Bcf/d vs. 12 Bcf/d LNG Exports

	Reference	High Resource
GDP	0.03%	0.03%
Manufacturing	0.02%	0.02%
Chemicals	0.00%	0.00%
Basic metals	0.04%	0.05%
Iron and Steel	0.04%	0.04%
Metal Products	0.04%	0.05%
Non-Metallic Minerals	-0.03%	-0.04%
Glass	-0.01%	-0.02%
Cement, Plaster, Concrete	-0.04%	-0.05%
Pulp and Paper	0.06%	0.06%
Agriculture	0.01%	0.02%
Extraction	1.81%	2.39%
Construction	0.16%	0.15%
Services	-0.01%	-0.02%

As with the domestic Reference case, impacts from changes in investment and natural gas prices outside of the United States are muted. In aggregate, the increase in LNG exports has little impact on total output in the long run. Impacts on the manufacturing sector in aggregate are similarly limited. Also, the distribution of results at the sector level (see Table 6) across the HRR scenarios is also similar to those across the domestic Reference scenarios.

Manufacturing output overall is marginally higher in the 20 Bcf/d export case, but lags output overall due to the impacts of higher natural gas prices on energy-intensive production. As in the Reference domestic case, some energy-intensive sectors see small declines in output compared with the 12 Bcf/d export case (see Figure 31), and these negative impacts are slightly larger in the High Resource case due to the larger increase in domestic natural gas prices. Nevertheless these are again negligible compared with the projected output growth of these sectors, and have little noticeable effect on the manufacturing sector as a whole.

Figure 31. EIS vs. Non-EIS Value-Added, 20 Bcf/d vs. 12 Bcf/d LNG Exports in the High Domestic Resource Scenario (2026–2040)



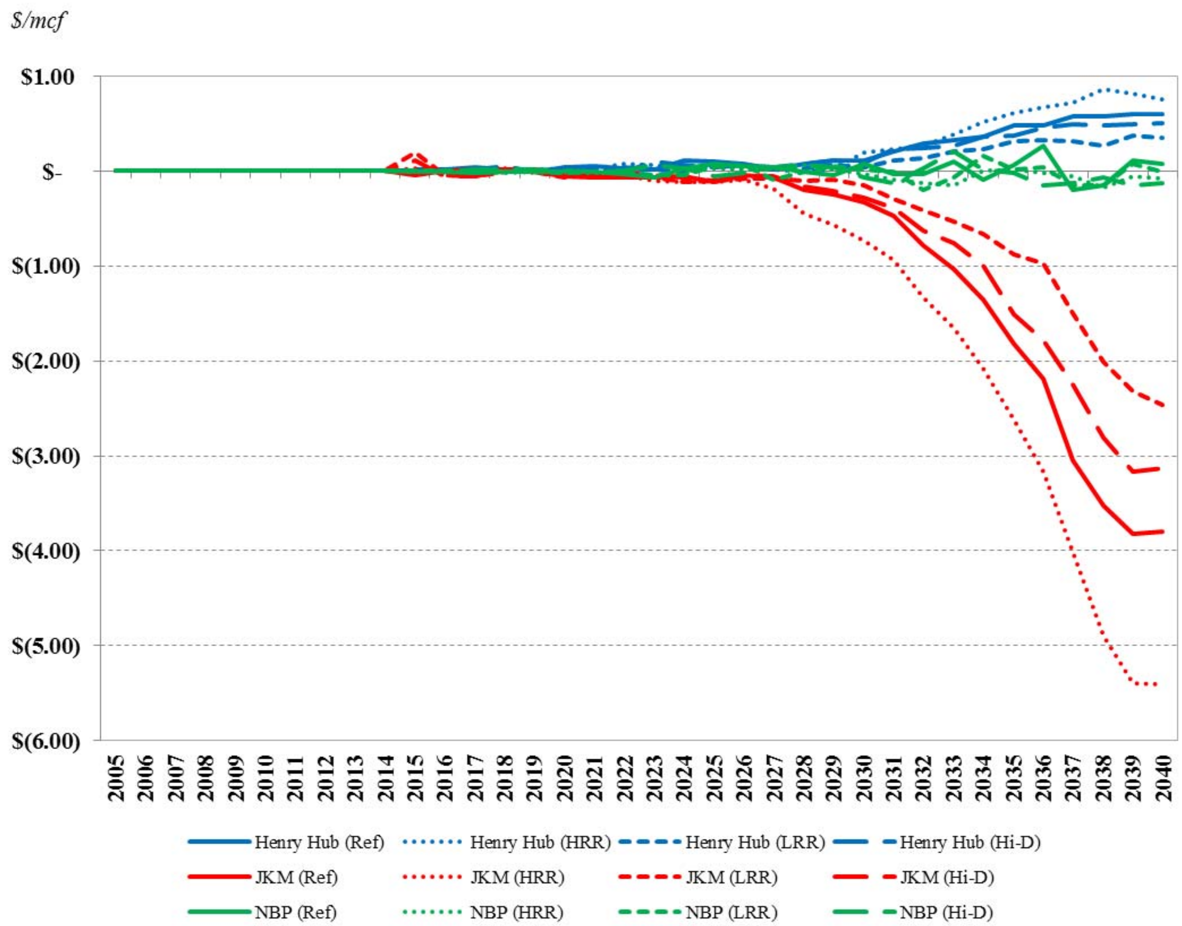
4.2 U.S. LNG Exports Increase from 12 Bcf/d to an Endogenously Determined Level

4.2.1 Natural Gas Market Impacts

In this section, we highlight the scenarios where U.S. LNG exports respond endogenously to demand pull created by international market conditions that are supportive of 20 Bcf/d of U.S. LNG exports under the four different domestic scenarios. We compare these each scenario to the cases where U.S. LNG exports do not exceed 12 Bcf/d (LNG20_Ref12, LNG20_HRR12, LNG20_LRR12, and LNG20_Hi-D12).

As indicated in Figure 32, the Henry Hub price rises as LNG exports increase while other international benchmark prices decline. As in section 4.1, this is the result of allowing increased trade from the United States thereby serving to relax the highly constrained supply situation internationally.

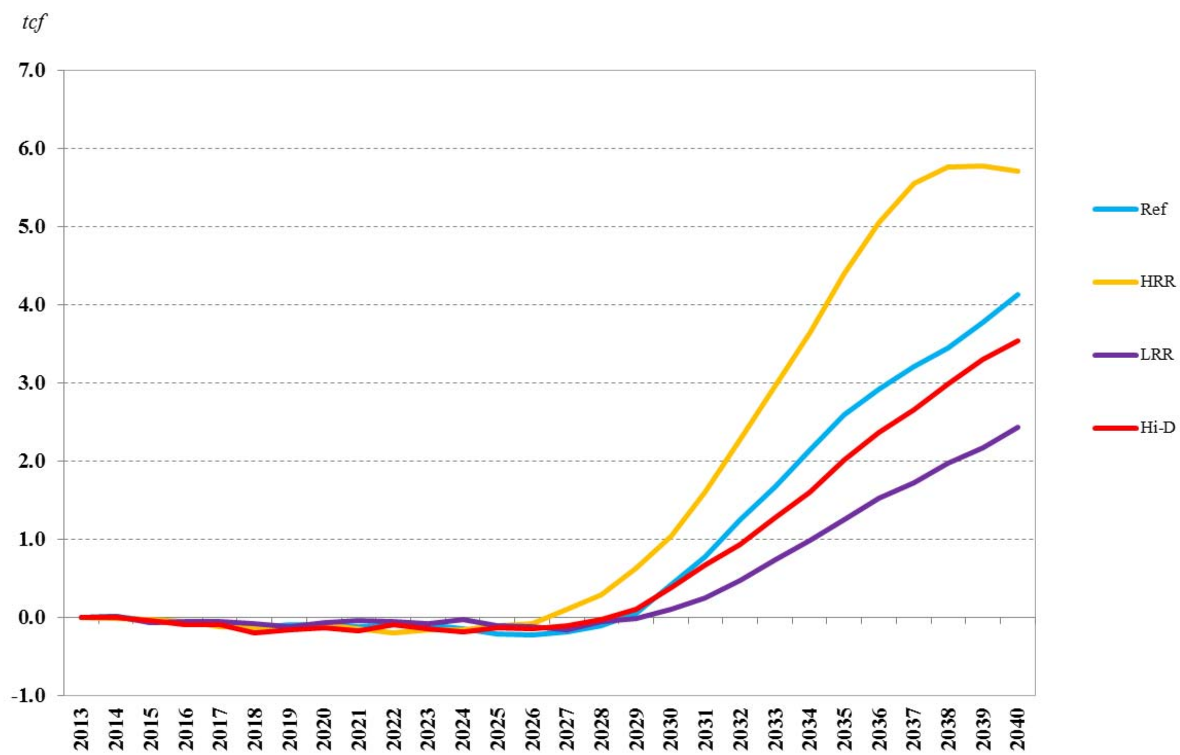
Figure 32. Change in Global Gas Prices
(endogenous exports vs. LNG20 cases where U.S. LNG exports cannot exceed 12 Bcf/d)



As noted in section 4.1, the price response in Asia tends to be greatest as U.S. LNG exports increase. The largest increase in exports occurs in the HRR cases, and it is in these cases where we see the largest increase in Henry Hub (topping out at $0.86 in the late 2030s) and the largest decrease in JKM (approaching $5.50 by 2040). As before, there is virtually no change across the scenarios in the NBP price.

In all cases, as LNG exports increase beyond 12 Bcf/d, U.S. production continues to increase through the time horizon. As indicated in Figure 33, the largest increase in domestic production occurs in the HRR cases, followed by the Ref cases and the Hi-D cases, with the LRR cases seeing the smallest increases in production. Not surprisingly, this is consistent with the change in LNG exports seen across cases and highlighted in section 3.

Figure 33. Changes in Domestic Production
(endogenous exports vs. LNG20 cases where U.S. LNG exports cannot exceed 12 Bcf/d)

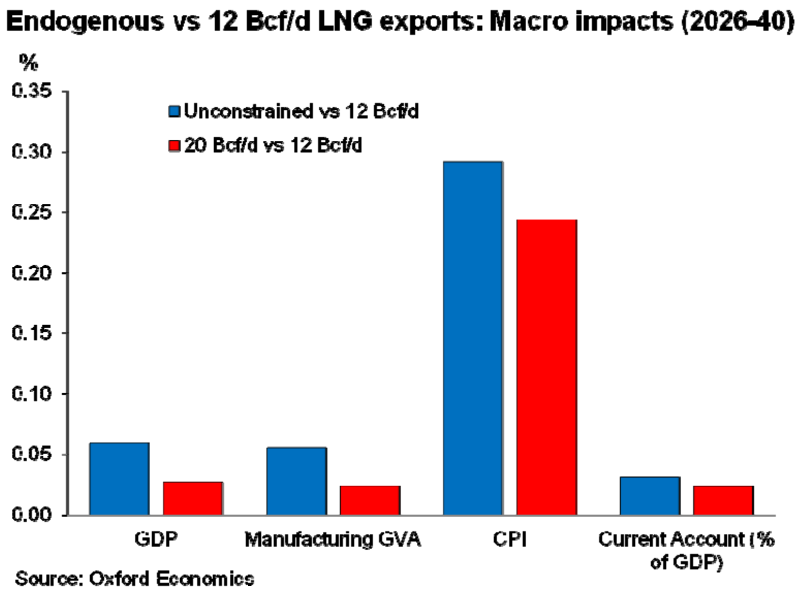


4.2.2 Macroeconomic Impacts

As in the case where LNG exports rise to 20 Bcf/d, the results of increasing exports from 12 Bcf/d to their market-determined level are marginally positive in the Reference domestic scenario. When exports fully respond to international demand conditions we see a larger increase in investment in the natural gas sector than when exports do not exceed 20 Bcf/d. As a result, the endogenous LNG export case produces slightly more positive results than the 20 Bcf/d LNG export case, though the impacts are still very small (see Figure 34).

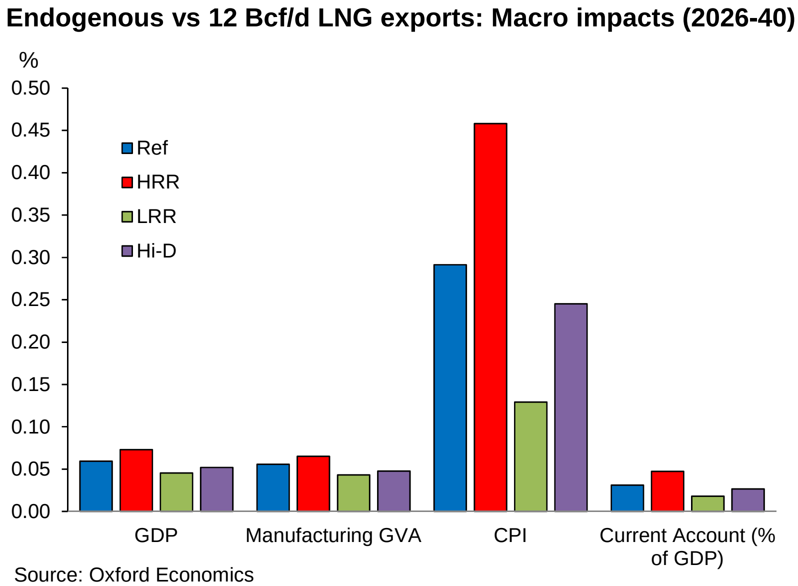
At the same time there is also a greater convergence of domestic natural gas prices with world prices when U.S. LNG exports are allowed to respond fully to global demand conditions as the Henry Hub price increase is greater than in the case where LNG exports could not exceed 20 Bcf/d. Although this helps drive the sector's profits marginally higher, the larger increase in gas prices generates a larger impact on consumer prices in the long run, which offsets some of the positive demand impacts of increased natural gas sector investment by lowering consumption. It should be noted, however, that the price level impacts are small and have little noticeable impact on inflation rates over the forecast horizon. Impacts to the current account are again limited, reflecting both the small direct impact from the increase in net fuel exports and the minor impact of changes in relative natural gas prices on the U.S. export sector overall.

Figure 34. Macroeconomic Impacts of Increasing LNG Exports from 12 Bcf/d, 2026–2040



Results across the alternative domestic scenarios are broadly similar (see Figure 35). In all four cases, impacts on GDP are between 0.05 and 0.07 percent on average over the 2026–2040 period, with the biggest impact in the HRR case where production responds most.

Figure 35. Macroeconomic Impacts of Increasing LNG exports, 2026–2040



General price level impacts vary with the change in natural gas prices, but even in the High Resource case, where the impact on Henry Hub prices is the largest, consumer prices are on average just 0.5 percent above the 12 Bcf/d export case over the period 2026–2040. The current account is also little impacted across the domestic cases given the small net export and gas price impacts. The pattern observed in the channel level impacts is consistent across the scenarios, and consistent with that described in in section 4.1.2. Larger increases in natural gas production and exports, which drive larger direct impacts on GDP, are associated with greater increases in domestic natural gas prices, and these contribute to larger negative impacts on consumption and non-fuel exports (see Table 7). Across all scenarios the impacts on profits are negligible, as are the feedback impacts of changes in the natural gas sector outside the United States. Though there are substantial impacts on Asian natural gas prices, the feedback impacts on the U.S. economy are minimal due to the relatively small share of energy consumption accounted for by gas in Asia.

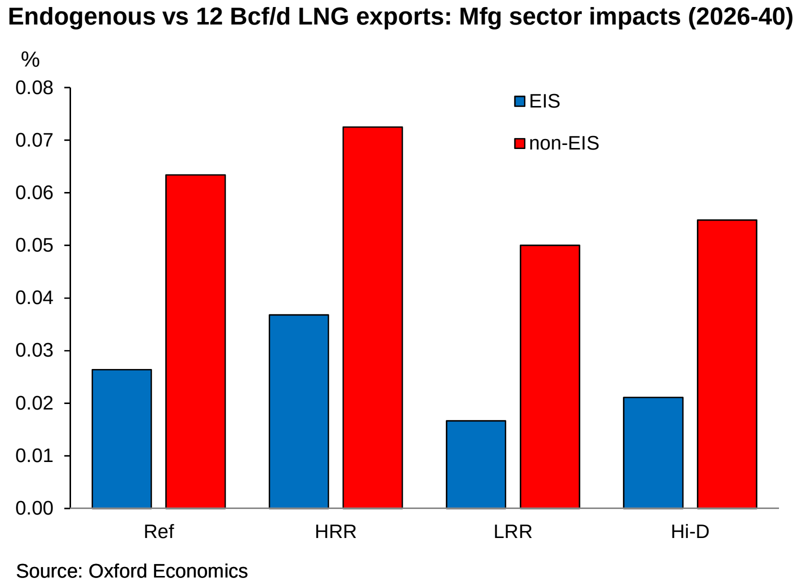
As in the 20 Bcf/d export cases, the energy-intensive sectors generally underperform other downstream sectors (see Figure 36) due to the impacts of higher energy prices.[18]

Table 7. Change in Key Scenario Drivers and Scenario Results (2026–2040), Endogenous LNG Exports vs. 12 Bcf/d LNG Exports

	Reference	High Resource	Low Resource	High Demand
Scenario Drivers				
United States				
NG Production	5.2%	8.5%	2.8%	4.1%
NG Consumption	0.1%	0.5%	0.0%	0.2%
NG Exports	33%	47%	17%	26%
NG Imports	4.3%	4.6%	1.2%	2.6%
Net Fuel Exp. (% of GDP)	0.03%	0.04%	0.01%	0.02%
Henry Hub Price	5.2%	7.5%	2.6%	4.3%
Capex (% of GDP)	0.10%	0.14%	0.07%	0.09%
Profits (% of GDP)	0.04%	0.05%	0.02%	0.03%
Rest of World				
Prices:				
NBP (UK)	0.1%	-0.4%	-0.2%	-0.3%
German Border (NW Europe)	0.1%	-0.1%	-0.1%	0.0%
JKM (Asia-Pacific)	-8.4%	-12.4%	-4.6%	-6.7%
Capex (% of GDP)	0.00%	0.00%	0.00%	0.00%
Scenario Results				
GDP Change by Channel				
Total	0.06%	0.07%	0.05%	0.05%
U.S. NG Output and Capex	0.14%	0.20%	0.09%	0.12%
U.S. NG Price	-0.10%	-0.15%	-0.05%	-0.08%
NG Profits	0.02%	0.03%	0.01%	0.02%
Rest of World Output and Capex	0.00%	-0.01%	0.00%	0.00%
Rest of World NG Prices	0.00%	0.00%	0.00%	0.00%
Manufacturing GVA	0.06%	0.03%	0.04%	0.05%

[18] The lone exception is the High Resource scenario, though the difference is statistically insignificant.

Figure 36. EIS vs. Non-EIS Value-Added, Endogenous vs. 12 Bcf/d LNG Exports (2026–2040)



5 Concluding Remarks

The results detailed in this report suggest that the overall macroeconomic impacts of LNG exports are marginally positive. When U.S. LNG exports increase from 12 Bcf/d against the backdrop of an international environment that is consistent with the United States being able to export 20 Bcf/d of LNG, then the overall gain to the U.S. economy is between 0.03 and 0.07 percent of GDP over the period of 2026–2040, or between $7 and $21 billion USD annually in today's prices.

We identified five main channels that determine of the overall economic impact of increasing LNG exports from the United States. These transmission channels are associated production and investment in the natural gas sectors in the United States and the rest of the world, Henry Hub and international natural gas prices, and the profitability of U.S. natural gas producers. The main channel for positive impacts when U.S. LNG exports increase to a higher level, is through higher production and greater investment in the natural gas sector in the United States. This is due to the fact that most of any U.S. LNG exports would be made possible by increased extraction rather than the diversion of natural gas supplies. U.S. production is between 2.8 and 8.5 percent higher on average over the period 2026–2040 when U.S. LNG exports are increased. The resulting economic benefit typically exceeds any drag on the economy from the main negative impact channel of higher domestic natural gas prices, as this extra natural gas production utilizes high cost resources.

However, the impacts on the U.S. economy through these channels are small. Over the period 2026–2040, the capital investment needed to increase U.S. natural gas production and exports averages between 0.06 and 0.14 percent of GDP, while Henry Hub natural gas prices are between 2.6 and 7.5 percent higher compared to when U.S. LNG exports are 12 Bcf/d. The bulk of the macroeconomic impacts are seen in the period 2026–2040, as this is when developments across scenarios in the natural gas market are the most varied.

Similar to previous studies, our results also suggest an increase in LNG exports from the United States will generate small declines in output at the margin for the energy-intensive, trade-exposed industries. The sectors that appear most exposed are cement, concrete, and glass, but the estimated impact on sector output is very small compared to expected sector growth to 2040. Other sectors benefit from increasing U.S. LNG exports, especially the industries that supply the natural gas sector or benefit from the capex needed to increase production. This includes some energy-intensive sectors such as cement and helps offset some of the impact of higher energy prices.

The results are robust to alternative assumptions for the U.S. natural gas market. The gain for the U.S. economy is greatest when higher levels of resource recovery are assumed in the United States, reflecting a larger increase in production, but the overall impact remains positive in cases with lower resource recovery and higher demand for natural gas in the United States.

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Annex A Background and Statement of Work

The Department of Energy's (DOE) Office of Fossil Energy (FE) has received 45 applications requesting long-term authorization to export domestically produced, lower-48 natural gas as liquefied natural gas (LNG) to non-free trade agreement (FTA) countries in a volume totaling the equivalent of 45.1 billion standard cubic feet per day (Bcf/d) of natural gas.[19] Of these, DOE/FE has granted final authorization for ten applications totaling 9.99 Bcf/d. Currently, the Federal Energy Regulatory Commission is reviewing proposed, lower-48, large-scale LNG export facilities totaling 24.325 Bcf/d under the requirements of the National Environmental Policy Act (NEPA), and has granted authorization to construct six other terminals totaling 10.62 Bcf/d.[20] The Natural Gas Act (NGA), 15 U.S.C. § 717b requires DOE to conduct a public interest review of applications to export LNG and to grant the applications unless DOE finds that the proposed exports will not be consistent with the public interest.[21] Under this provision, DOE performs a thorough public interest analysis before acting.[22]

In 2012, when DOE/FE had received only three applications totaling less than 6 Bcf/d to export LNG to non-FTA countries, DOE/FE commissioned two natural gas export studies—one by EIA and one by NERA Economic Consulting. The studies evaluated macroeconomic and other impacts of LNG exports

[19] As of July 1, 2015.
http://energy.gov/sites/prod/files/2015/07/f24/Summary%20of%20LNG%20Export%20Applications_0.pdf.

[20] As of June 18, 2015. http://www.ferc.gov/industries/gas/indus-act/lng/lng-export-proposed.pdf and http://www.ferc.gov/industries/gas/indus-act/lng/lng-approved.pdf.

[21] The authority to regulate the imports and exports of natural gas, including liquefied natural gas, under section 3 of the NGA has been delegated to the Assistant Secretary for FE in Redelegation Order No. 00-002.04E issued on April 29, 2011.

[22] Under NGA section 3(c), the import and export of natural gas, including LNG, from and to a nation with which there is in effect an FTA requiring national treatment for trade in natural gas and the import of LNG from other international sources are deemed to be consistent with the public interest and must be granted without modification or delay. Exports of LNG to non-FTA countries have not been deemed in the public interest and require a DOE/FE review.

from 6 to 12 Bcf/d, the results of which have been used by DOE/FE in evaluating export authorizations.[23]

On May 29, 2014, DOE/FE announced its intention to undertake an updated economic study in order to gain a better understanding of how potential U.S. LNG exports between 12 and 20 Bcf/d could affect the public interest. Specifically, DOE/FE commissioned EIA to update its 2012 LNG Export Study using the *Annual Energy Outlook 2014*.[24]

Further, DOE/FE determined that it would follow the EIA LNG Export Study with an additional study that would evaluate macroeconomic impacts of the exports evaluated in the EIA study and directed the National Energy Technology Laboratory (NETL) to facilitate the performance of this additional analysis. The task was to evaluate the macroeconomic impacts of U.S. LNG exports up to 20 Bcf/d determined by international demand based on a variety of domestic and international scenarios. Further, the task was to assess the potential international demand for U.S. LNG and/or the potential level of U.S. exports that could be supported by the global market, and then to evaluate the macroeconomic impacts of U.S. LNG exports on the U.S. economy, using multiple economic indicators, with an emphasis on the energy sector, and natural gas and energy-intensive industries in particular.

DOE specified that the analysis must rely on authoritative economic models of the U.S. and global economies, U.S. industry (particularly the energy-intensive sector), and the international natural gas market. Also, the analysis had to consider a range of scenarios representing varied assumptions

[23] The EIA and NERA studies can be found at http://www.energy.gov/fe/services/natural-gas-regulation/lng-export-study.
[24] The DOE request can be found here http://energy.gov/fe/downloads/request-update-eia-s-january-2012-study-liquefied-natural-gas-export-scenarios.

regarding export levels, economic growth, global market conditions, and domestic natural gas fundamentals.

NETL directed Leonardo Technologies Inc. (LTI), the prime contractor for its Program and Performance Management Services (PPM) support contract (DE-FE0004002), to carry out the task. LTI determined that it did not have the "authoritative models" called for, nor did it have the economic modeling expertise required to perform this work quickly. Accordingly, it was necessary for LTI to contract with an appropriate subcontractor or subcontractors in order to carry out the work to DOE specifications.

LTI began by compiling a list of known economic consultants with reputations for robust, authoritative modeling of domestic and international energy issues. LTI then cross-walked these firms against a list of companies that had contributed economic analyses as part of the application process followed by companies seeking to export LNG. Many of these companies had either past or present consulting relationships with companies seeking approval from DOE to export LNG and thus were considered to have potential conflicts of interest. For commercial reasons, some companies indicated that they would not be interested in performing this type of public analysis.

LTI determined that the best course of action would be to divide the work into two key subtasks:

- Subtask 1: Determination of international demand for U.S. LNG under different scenarios.
- Subtask 2: Determination of U.S. macroeconomic impacts of various LNG export scenarios consistent with international demand.

Given the need for meeting the criteria listed above, it was determined that separate contractors should be selected for the tasks. After a due diligence evaluation of the capabilities of the available alternatives, LTI selected Dr. Kenneth Medlock with the Center for Energy Studies at Rice University's Baker Institute as the subcontractor for Subtask 1, and Oxford Economics as the subcontractor for Subtask 2.

The final Statement of Work provided to LTI by NETL is found in Annex A.1.

A1. Statement of Work

Study to Assess Macroeconomic Impacts of U.S. Liquefied Natural Gas (LNG) Exports

<u>INTRODUCTION</u>:

The Department of Energy's (DOE) Office of Fossil Energy (FE) has received 36 applications requesting long-term authorization to export domestically produced, lower-48 natural gas as liquefied natural gas (LNG) to non-free trade agreement (non-FTA) countries in a volume totaling the equivalent of 38.06 billion standard cubic feet per day (Bcf/d) of natural gas.[25] Of these, DOE/FE has granted final authorization to three applicants totaling 3.94 Bcf/d. Currently, the Federal Energy Regulatory Commission is reviewing proposed, lower-48, large-scale LNG export facilities totaling 17.47 Bcf/d under the requirements of the National Environmental Policy Act (NEPA), and has granted authorization to construct four other terminals totaling 7.08 Bcf/d.[26] The Natural Gas Act (NGA), 15 U.S.C. § 717b requires DOE to conduct a public interest review of applications to export LNG and to grant the applications unless DOE finds that the proposed exports will not be consistent with the public interest.[27] Under this provision, DOE performs a thorough public interest analysis before acting.[28]

In 2012, when DOE/FE had received only 3 applications totaling less than 6 Bcf/d to export LNG to non-FTA countries, DOE/FE commissioned two natural gas export studies – one by EIA and one by NERA Economic Consulting. The studies evaluated macroeconomic and other impacts of LNG exports from 6 to 12 Bcf/d, the results of which have been used by DOE/FE in evaluating recent export authorizations.

On May 29, 2014, DOE/FE announced its intention to undertake an updated economic study in order to gain a better understanding of how potential U.S. LNG exports between 12 and 20 Bcf/d could affect the public interest. Specifically, DOE/FE commissioned EIA to update its 2012 LNG Export Study using the *Annual Energy Outlook (AEO) 2014*.[29]

DOE/FE and the National Energy Technology Lab (NETL) will follow the EIA LNG Export Study with a study that will evaluate macroeconomic impacts of the exports evaluated in the EIA study. If at any future time the cumulative export authorizations approach the high end of export cases examined,

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[25] As of November 7, 2014.
[26] As of October 14, 2014. http://www.ferc.gov/industries/gas/indus-act/lng/lng-export-proposed.pdf and http://www.ferc.gov/industries/gas/indus-act/lng/lng-approved.pdf
[27] The authority to regulate the imports and exports of natural gas, including liquefied natural gas, under section 3 of the NGA has been delegated to the Assistant Secretary for FE in Redelegation Order No. 00-002.04E issued on April 29, 2011.
[28] Under NGA section 3(c), the import and export of natural gas, including LNG, from and to a nation with which there is in effect a free trade agreement (FTA) requiring national treatment for trade in natural gas and the import of LNG from other international sources are deemed to be consistent with the public interest and must be granted without modification or delay. Exports of LNG to non-FTA countries have not been deemed in the public interest and require a DOE/FE review.
[29] DOE/FE's request to EIA, including the study scope can be found at http://www.energy.gov/fe/downloads/request-update-eia-s-january-2012-study-liquefied-natural-gas-export-scenarios

the DOE will conduct additional studies as needed to understand the impact of higher export ranges. At all levels, the cumulative impacts will remain a key criterion in assessing the public interest.

PURPOSE:

The purpose of this task is to evaluate the macroeconomic impacts of U.S. LNG Exports at levels up to 20 billion standard cubic feet per day (Bcf/d) determined by international demand across several scenarios based on domestic and international cases. The analysis will have two elements: first, to assess the potential international demand for U.S. LNG, and second, to evaluate the macroeconomic impacts of U.S. LNG exports on the U.S. economy, using multiple economic indicators, with an emphasis on the energy sector, and natural gas and energy-intensive industries in particular.

To conduct these evaluations, the prime contractor will identify and employ subcontractors with authoritative econometric models of the U.S. and global economies, U.S. industry, particularly the energy-intensive sector, and the international natural gas market. The analysis will consider a range of scenarios representing varied assumptions regarding export levels, economic growth, global market conditions, and domestic natural gas supply and demand.

ANALYSIS TO BE PERFORMED:

To inform the public-interest determinations of LNG export applications, the two tasks will be performed as outlined below.

Task 1: Scenario Analysis of International Demand for U.S. LNG Exports and Market Conditions of the Global Natural Gas Market. This analysis will provide three reasonable scenarios of international demand for U.S. LNG exports over the 2015-2040 timeframe. These demand scenarios will include a range of plausible conditions for the global natural gas market. The contractor will develop a most likely reference case for the global natural gas market and four sensitivity cases that reflect higher levels of international demand for LNG, modeled across a range of domestic resource and demand cases (See Table 1). These cases will be developed with and approved by DOE prior to model runs. The output of this task will be an input to Task 2 described below. At a minimum, the output of this task will address the following characteristics of the global natural gas market over the analysis timeframe in each of the three cases:

a. Demand for U.S. LNG exports segmented by U.S. geographical area of export;
b. Global natural gas production by region;
c. Global natural gas consumption by region;
d. Pricing mechanisms in each region for natural gas;
e. Global wellhead prices by region;
f. Global City Gate prices by region;
g. Global liquefaction costs by region;
h. Global regasification costs by region;

i. Global transportation costs by region;
j. Global supply elasticities by region; and
k. Global demand elasticities by region.

Task 2: U.S. Macroeconomic Impact and Price Response Based on International Demand for U.S. LNG Exports. This analysis will assess the macroeconomic impact of U.S. LNG exports at levels determined by international demand as identified in Task 1 across several scenarios based on domestic and international cases. The price impacts of LNG exports should be incorporated, including a discussion of how domestic natural gas prices are determined and the potential for correlation between domestic and international natural gas prices. This report should include a discussion on fuel demand scenarios, such as demand for natural gas in the power sector, and fuel investment scenarios, such as investment capacity to build the facilities and investment in production scenarios. This analysis should incorporate any spillover effects from the impact of LNG exports on global macroeconomic performance, including discussion of direct, indirect, induced, and catalytic impacts.

a. Timeframe: The timeframe for analysis is from 2015-2040.
b. Domestic Scenarios. The following domestic scenarios will be considered:
    i. A domestic reference case;
    ii. Low oil and gas recoverability case;
    iii. High oil and gas recoverability case; and
    iv. High natural gas demand case.
c. International Scenarios. The international scenarios and assumptions identified in Task 1 will be considered:
    i. The international reference case;
    ii. Sensitivity case 1 with global energy market conditions such that demand for U.S. export volumes is at 12 Bcf/d for the domestic reference case; and
    iii. Sensitivity case 2a with global energy market conditions such that demand for U.S. exports is at 20 Bcf/d for the domestic reference case but U.S. export volumes do not exceed 12 Bcf/d.
    iv. Sensitivity case 2b with global energy market conditions such that demand for U.S. exports is at 20 Bcf/d for the domestic reference case and U.S. export volumes do not exceed 20 Bcf/d.
    v. Sensitivity case 2c with global energy market conditions such that demand for U.S. export volumes is at 20 Bcf/d for the domestic reference case and U.S. export volumes are unconstrained.
d. Indicators. This analysis will consider, at a minimum, the impact of LNG exports using the below economic indicators:
    i. U.S. natural gas prices;
    ii. U.S. Gross Domestic Product (GDP);
    iii. Levels of U.S. employment;

iv. U.S. aggregate consumption;
v. U.S. aggregate investment;
vi. U.S. natural gas export revenues;
vii. U.S. government receipts;
viii. U.S. current account; and
ix. Energy-intensive industry performance.

Table 1: Scenarios to be analyzed in the Macroeconomic Model Based on International Demand for U.S. LNG Exports up to 20 Bcf/d

International Demand Cases		**Domestic Scenarios**			
		Reference	**High Resource Recovery**	**Low Resource Recovery**	**High Natural Gas Demand**
Reference		Ref_Ref	Ref_HRR	Ref_LRR	Ref_Hi-Demand
Sensitivity Case 1 – Global Demand for U.S. LNG at 12 Bcf/d		12B_Ref	12B_HRR	12B_LRR	12B_Hi-Demand
Sensitivity Case 2 – Global Demand for U.S. LNG at 20 Bcf/d	a.US Exports Limited to 12 Bcf/d	20B_Ref_Cap12	20B_HRR_Cap12	20B_LRR_Cap12	20B_Hi-Demand_Cap12
	b.US Exports Limited to 20 Bcf/d	20B_Ref_Cap20	20B_HRR_Cap20	20B_LRR_Cap20	20B_Hi-Demand_Cap20
	c.Endogenous US Export Level	20B_Ref	20B_HRR	20B_LRR	20B_Hi-Demand

e. Macroeconomic performance comparisons will include, among other comparisons to be provided, an analysis of the impact of increasing export volumes from 12 Bcf/d to 20 Bcf/d when there is sufficient global demand for the higher level of exports via the following comparisons:
   i. 20B_Ref_Cap20 case compared to 20B_Ref_Cap12;
   ii. 20B_HRR_Cap20 case compared to 20B_HRR_Cap12;
   iii. 20B_LRR_Cap20 case compared to 20B_LRR_Cap12; and
   iv. 20B_Hi-Demand_Cap20 case compared to 20B_Hi-Demand_Cap12.

DELIVERABLES:

The following deliverables will be provided to DOE/FE/NETL.

1. Kickoff meeting with prime contractor, subcontractors, DOE-FE, and NETL representatives in attendance to formally agree on study objectives, flow, and timing of milestones and deliverables by both subcontractors and prime contractor. Special attention will be paid to the inputs required from the subcontractor for Task 1 required the subcontractor for Task 2.
2. Work plan with schedule and milestones. Within two weeks after the initiation of the study, the contractor will provide DOE/FE/NETL with a work plan that outlines the study approach to include a schedule of key activities and milestones. There is no prescribed format.
3. Weekly status updates. Each week, the prime contractor will provide an update regarding the study's progress to DOE/FE/NETL staff. These updates will typically be conducted as conference calls. The subcontractors may be required to participate as necessary.
4. Working level conference call meetings to discuss the Task 1 model results, their integration with Task 2 modeling, and a review of a broad range of key econometric parameters. This would include confirmation of alignment of the model with the EIA scenarios, and assumptions/results on other key energy and major macroeconomic variables. The subcontractors will be required to participate.
5. Working level meeting to discuss Task 2 model results, and a review of a broad range of key econometric parameters. This would include confirmation of alignment of the model with the EIA scenarios, and assumptions/results on other key energy and major macroeconomic variables. The subcontractors will be required to participate.
6. Preliminary findings report and presentation. The contractor will prepare a preliminary report, integrating individual Task reports provided by subcontractors, that discusses the draft findings of the three areas of analysis and will provide to DOE/FE for review. The prime contractor will prepare an integrated presentation to accompany the preliminary report for use in briefing DOE/FE/NETL and other government officials regarding the study. The prime contractor, together with appropriate representatives from each of the subcontractors, will discuss the preliminary findings with DOE/FE/NETL staff and determine whether the scenarios and assumptions identified are still valid, some cases should be eliminated, and/or other cases added. Should additional work beyond that outlined in this Statement of Work (SOW) be identified, appropriate alterations to this SOW, together with allocated funding adjustments, will be developed and implemented.
7. Final report. The prime contractor will prepare a final report incorporating final reports from both Task 1 and Task 2 subcontractors that explains in detail the findings of the three areas of

analysis and will provide to DOE/FE/NETL. This final report will be released for public comment and published in the public domain.

8. Response to questions. After releasing the study results, at the request of DOE/FE/NETL, the prime contractor, with input from appropriate subcontractors, will prepare written responses to questions about the study raised through public comment or export application proceedings.

Deliverable	Due Date
Kickoff meeting	Upon completion of subcontracts (Feb 3, 2015)
Work plan with schedule and milestones	2 weeks from kickoff meeting
Status updates	Weekly
Discussion of preliminary Task 1 results	4 to 11 weeks from kickoff meeting
Delivery of revised Task 1 results to Task 2 contractor	13 weeks from kickoff meeting
Discussion of preliminary Task 2 results	15 weeks from kickoff meeting (May 19, 2015)
Preliminary findings report	17 weeks from kickoff meeting (June 1, 2015)
Final report	20 weeks from kickoff meeting (June 19, 2015)
Response to questions	TBD following final report

Annex B Modeling Approach

B1. The Rice World Gas Trade Model

The RWGTM is a dynamic spatial partial equilibrium model in which all spatial and temporal arbitrage opportunities in natural gas markets are captured. As such, each point of infrastructure in the gas delivery value chain—field development, pipelines, LNG regasification, LNG shipping, and LNG liquefaction—is modeled as an independent, intertemporal, profit-maximizing entity. Thus, in addition to a host of fixed parameters such as the upfront fixed cost, interest rate on debt, required return on equity, debt-equity ratio, income tax rate, sales tax rate, and royalty, the optimal investment path for field development is dependent on the wellhead price and for transportation infrastructure on the tariff collected. In this manner, the model is solving a classic intertemporal optimization problem for investment in fixed capital infrastructure.[30]

Put another way, the RWGTM proves and develops resources, constructs and utilizes transportation infrastructure, and calculates prices to equate demands and supplies while maximizing the present value of producer profits within a competitive framework. New capital investments in production and delivery infrastructure thus must earn a minimum return for development to occur. The debt-equity ratio is allowed to differ across different categories of investment, such as proving resources, developing wellhead delivery capability, constructing pipelines, and developing LNG infrastructure. By developing supplies, pipelines, and LNG delivery infrastructure, the RWGTM provides a framework for

[30] The initial conditions are calibrated to recent historical data. The terminal value condition must also be specified in order to find an optimal investment path in natural gas production and delivery infrastructure. As such, the transversality condition is modeled by assuming a competing technology, such as solar, becomes available at a specified delivered price to consumers in unlimited quantities. The RWGTM Reference case assumes the competing price is $14 per mcf equivalent in 2020, declining to $9 per mcf equivalent by 2070. We have run scenarios where the adoption of the backstop is accelerated through cost reductions, but that is not germane to this proposed study.

examining the effects of different economic and political influences on the global natural gas market within a framework grounded in geologic data and economic theory. In fact, the RWGTM has been used to this end in multiple studies and published works.[31]

B1a. Demand in the RWGTM

Regions in the RWGTM are defined at the country and sub-country level into 290 regional demand sinks, with extensive representation of natural gas transportation infrastructure. The extent of detail in each region is primarily based on data availability. In addition, demand sinks are situated along transportation networks in order to simulate actual flows of natural gas. Countries and regions with well-developed energy infrastructure, such as the United States, have extensive sub-regional detail, which allows better understanding of the effects that intra-regional capacity constraints and differences in regional policies may have on current and future market developments. Outside the United States, demand is modeled for the power-generation sector and all direct uses, which includes residential, commercial, and industrial demands. In the United States, demand is modeled at the state and sub-state level specifically for the residential, commercial, industrial, and power generation end-use sectors.

In the United States, sub-state demand representation is significant and is located based on data from the U.S. general and Economic Census—for example county-level populations—as well as the location

[31] For example, see Kenneth B. Medlock III, "Modeling the Implications of Expanded U.S. Shale Gas Production," *Energy Strategies Review* No. 1, (2012); Peter Hartley and Kenneth B. Medlock III, "Potential Futures for Russian Natural Gas," *Energy Journal*, Special Issue, "World Natural Gas Markets and Trade: A Multi Modeling Perspective" (2009); Peter Hartley and Kenneth B. Medlock III, "The Baker Institute World Gas Trade Model," in *Natural Gas and Geopolitics: 1970–2040*, edited by David Victor, Amy Jaffe, and Mark Hayes, Cambridge University Press (2006); Peter Hartley and Kenneth B. Medlock III, "Political and Economic Influences on the Future World Market for Natural Gas," in *Natural Gas and Geopolitics: 1970–2040*, edited by David Victor, Amy Jaffe, and Mark Hayes, Cambridge University Press (2006).

of power plants obtained from U.S. EPA NEEDS database. For example, there are 10 regions in Texas, 5 regions in California, 4 regions in Pennsylvania, and 5 regions in New York. Table B1 outlines the sub-regional detail of U.S. demand by state in the RWGTM.

Table B1. Example of Regional Detail in the RWGTM (U.S. Lower 48)

State	# of Regions	State	# of Regions	State	# of Regions
Alabama	2	Maine	1	Ohio	3
Arizona	2	Maryland*	3	Oklahoma	1
Arkansas	1	Massachesetts	2	Oregon	2
California	5	Michigan	2	Pennsylvania	4
Colorado	1	Minnesota	1	Rhode Island	1
Connecticut	2	Mississippi	4	South Carolina	2
Delaware	1	Missouri	1	South Dakota	1
Florida	4	Montana	1	Tennessee	2
Georgia	3	Nebraska	1	Texas	10
Idaho	1	Nevada	2	Utah	1
Illinois	2	New Hampshire	1	Vermont	1
Indiana	2	New Jersey	4	Virginia	3
Iowa	1	New Mexico	2	Washington	2
Kansas	1	New York	5	West Virginia	1
Kentucky	2	North Carolina	2	Wisconsin	1
Louisiana	4	North Dakota	1	Wyoming	3

* - includes Washington DC

Outside the United States, sub-national detail varies depending on infrastructure and data availability. For example, there are 6 regions in India, 8 regions in China, 6 regions in Germany, 4 regions in the UK, 10 regions in Australia, 1 region in Bangladesh, 2 regions in Thailand, etc.[32] In international locations, the distribution of natural gas demands outside the power-generation sector is based on regional populations obtained from the website City Population (http://www.citypopulation.de/). Natural gas demands in the power-generation sector are generally regionalized using the location of

[32] A more extensive detail is available upon request.

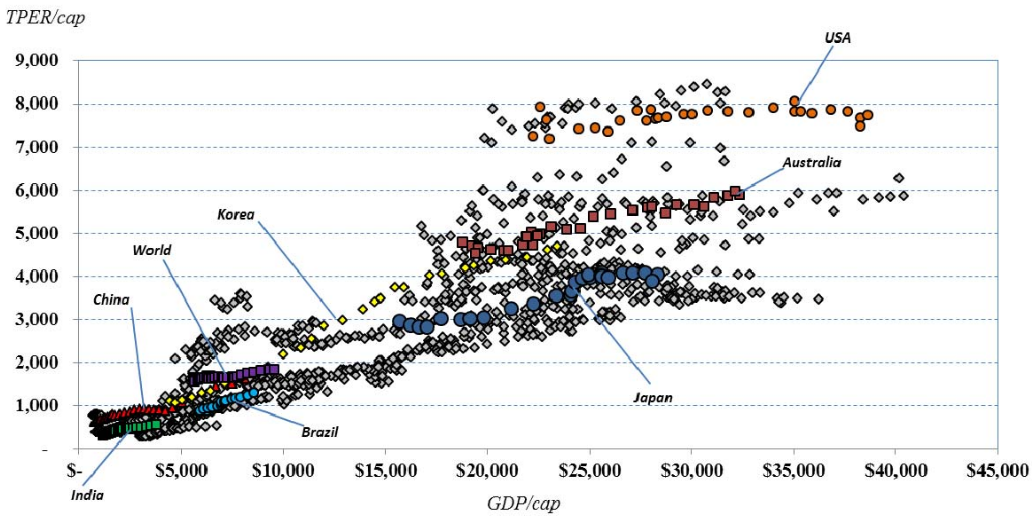
natural gas power plants, which is obtained from several sources, including *Platts* and the *Oil and Gas Journal*.

In order to forecast demand for natural gas, we begin by forecasting total primary energy requirement (TPER) for every country around the world. This is done by econometrically estimating the relationship between energy intensity (defined as TPER divided by GDP) and real (purchasing power parity adjusted) per capita income using a panel of 67 countries covering 1980–2010. This follows a large literature on the subject that has found energy intensity declines as per capita income rises, after rising to a peak generally associated with industrialization of an economy (see, for example, Medlock and Soligo [2001]). Specifically, as continued economic development begets changes in economic structure, and as improvements in end-use energy efficiency occur, energy intensity declines. This tends to drive a decline in the income elasticity of energy demand as per capita income rises.

Figure B1 indicates data for TPER per capita plotted against GDP per capita for 67 countries (in 2010$ USD). This is the data used to estimate the relationship between energy intensity and income. We have highlighted a few select countries for illustrative purposes. As can be seen in Figure B1, energy use increases with GDP. However, perhaps not as obvious, the rate of increase declines as economic development progresses. As referenced above, this is driven by both structural and technical change, and it leads to declining energy intensity.[33]

[33] Medlock (2009) expands on this point in great detail.

Figure B1. Total Primary Energy Requirement Across 67 Countries from 1980–2010



Source: International Energy Agency

Although the number of countries included in the estimation of the energy intensity-income relationship far from captures all countries, the countries included collectively account for over 90 percent of global energy demand. We use the estimated relationship to forecast TPER for all countries. This step requires us to multiply the forecast for energy intensity by a forecast for GDP. For the purpose of this study, GDP forecasts for use in the RWGTM are provided by Oxford Economics.[34] As population growth also matters, population growth rates are adopted from the United Nations mid-trend growth projections. These rates of growth, of course, vary significantly across countries, but we do not consider scenarios with alternative population growth rates in the analysis conducted herein.

TPER is disaggregated into demand by end-use sector designations—transport, other direct uses, and electric generation—and by component fuel shares—coal, gas, oil, nuclear, hydro, and other renewables. Sector demands are allowed to evolve according to econometrically fit relationships

[34] More detail on the forecasts can be made available upon request.

between electricity intensity of TPER and GDP and transport energy intensity of TPER and income. Other direct uses are modeled as the remainder of TPER.[35] We then incorporate announced policy dictating various forms of energy—such as nuclear, renewables, and hydro—and allow an econometric fit of the residual component shares (all of which are fossil fuels) to determine the mix of crude oil, natural gas, and coal in TPER by sector. The fuel shares are fit using a simultaneous equations framework that includes the effects of relative fuel prices. In addition, the econometric fits indicate that higher incomes reveal an increasing preference for natural gas versus coal, which is consistent with the *relative* preference ordering of environmental attributes increasing with rising incomes. The results of this exercise are depicted for the United States in Figure B2.

[35] So, we fit the share of electric generation in TPER against per capita income and the share of transportation energy in TPER against per capita income. The residual share is classified as other direct uses. The relationships are all non-linear, and the results generally indicate increasing electrification and transport orientation. Note these are shares, not absolute values.

Figure B2. Illustration of U.S. Demand (1992–2040) Estimation by Step

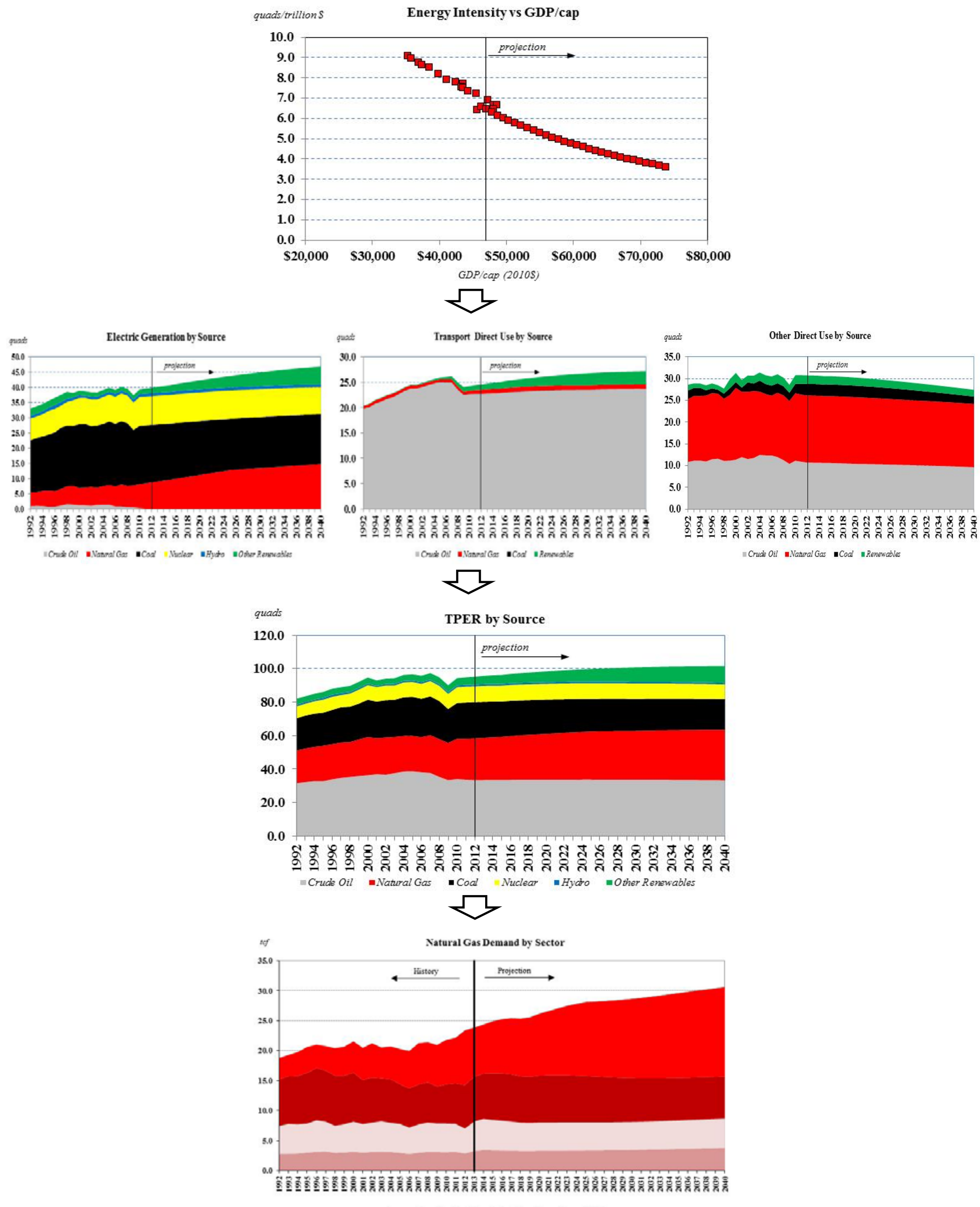


Exhibit R
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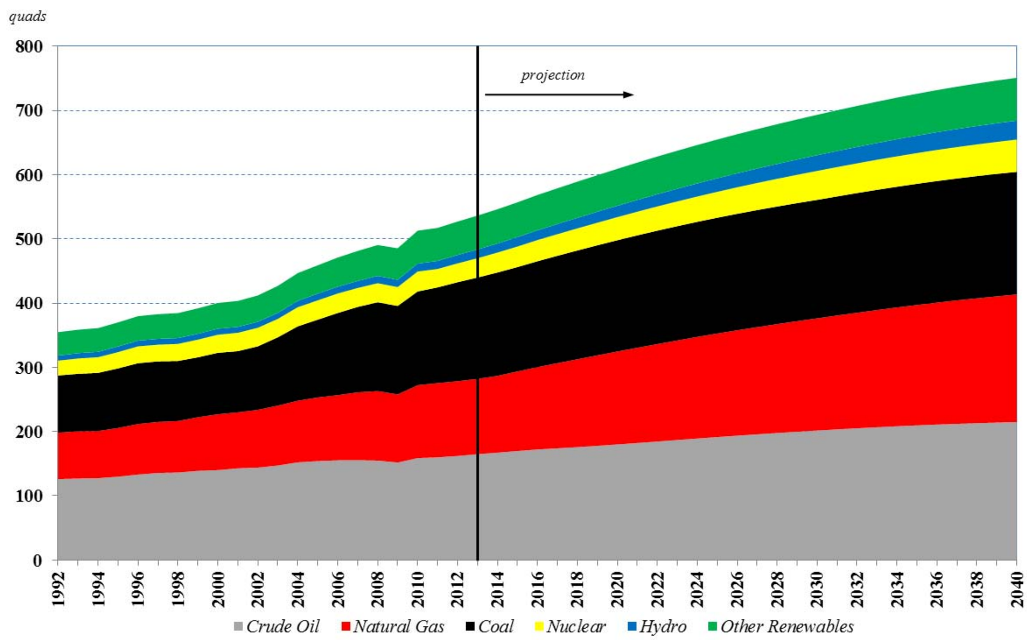
We generate forecasts for every country in the world in a similar manner. Aggregating across all countries yields the global TPER forecast seen in Figure B3.

Figure B3. Global TPER by Source



In addition, we generate forecasts by fuel source for every country in the world. It is important to point out that the forecast methodology as described is specific to a set of prices. As such, the demands in any given year are just one point along a demand curve. Thus, we call the initial demands that follow from this exercise the RWGTM "reference demand" because it is the demand that is associated with a specific reference price. The reference demand is included in the RWGTM along with the estimated price elasticity thus allowing demand to be price-responsive. As such, if the model-solved price deviates from the reference price, the demand in each end-use sector deviates from the reference demand according to estimated country-specific, sector-specific price elasticity.

Table B2. Implied Price Elasticity of Demand by Country/Region and Sector

Region	Countries	Direct Use	Power Gen
AFRICA	East Africa (Sudan/Ethiopia/Somalia/Kenya/Uganda/Tanzania)	-3.2811	-3.0875
	Algeria	-0.0945	-0.0332
	Egypt	-0.1403	-0.0354
	Libya	-0.2020	-0.0522
	Morocco	-0.5861	-0.1761
	Tunisia	-0.2383	-0.0339
	Southern Africa (South Africa/Namibia/Mozambique/Botswana)	-0.4050	-0.3418
	Angola	-0.1809	-0.4728
	Nigeria	-0.1512	-0.0327
	Northwest Africa	-0.4324	-1.1198
	West Central Coast Africa (Cameroon/Eq Guinea/Gabon/Congo)	-0.8257	-1.4507
ASIA and PACIFIC	Afghanistan	-1.1321	-0.1994
	Bangladesh	-0.1449	-0.0400
	China	-0.5872	-0.2632
	Hong Kong	-2.9761	-0.1080
	India	-0.5816	-0.1572
	Myanmar	-0.1411	-0.0581
	Nepal	-3.4637	-4.8156
	Pakistan	-0.1492	-0.0598
	Sri Lanka	-0.7934	-0.3116
	Thailand	-0.4131	-0.0479
	Vietnam/Laos/Cambodia	-0.5665	-0.0560
	Brunei	-0.0954	-0.0360
	Indonesia	-0.1877	-0.1150
	Japan	-0.7368	-0.0910
	Malaysia	-0.1492	-0.0465
	North Korea	-3.7623	-4.4502
	Philippines	-1.3388	-0.0949
	Singapore	-0.5043	-0.0363
	South Korea	-0.5342	-0.1613
	Taiwan	-1.1917	-0.1456
	Australia	-0.2593	-0.1379
	New Zealand	-0.3012	-0.1133
	Papua New Guinea	-1.2936	-0.2313
CENTRAL AND SOUTH AMERICA	Argentina	-0.1012	-0.0443
	Bolivia	-0.1358	-0.0373
	Brazil	-0.3258	-0.2105
	Central America	-3.5509	-3.7979
	Cuba	-0.5989	-0.1214
	Other Caribbean	-1.1636	-0.1052
	Chile	-0.2773	-0.0779
	Colombia	-0.1459	-0.0766
	Ecuador	-0.6186	-0.0900
	Paraguay	-3.4812	-4.0898
	Peru	-0.2777	-0.0493
	Suriname/Guyana/French Guiana	-0.8787	-0.0587
	Trinidad & Tobago	-0.0498	-0.0328
	Uruguay	-0.8240	-0.3858
	Venezuela	-0.0964	-0.0695

Region	Countries	Direct Use		Power Gen
EUROPE	Austria	-0.2209		-0.0987
	Balkans (Slovenia, Croatia, and Bosnia Herzegovina)	-0.1734		-0.0746
	Balkans (Albania, Macedonia, Serbia, Montenegro)	-0.2881		-0.4974
	Belgium	-0.1835		-0.0825
	Bulgaria	-0.3358		-0.2082
	Czech Republic	-0.2427		-0.3458
	Denmark	-0.2881		-0.1044
	Finland	-0.6130		-0.1504
	France	-0.3137		-0.4616
	Germany	-0.2153		-0.1528
	Greece	-0.6979		-0.1301
	Hungary	-0.1310		-0.0871
	Ireland	-0.2807		-0.0465
	Italy	-0.1386		-0.0495
	Luxembourg	-0.2442		-0.0419
	Netherlands	-0.1201		-0.0487
	Norway	-0.1886		-0.3947
	Poland	-0.2415		-0.4678
	Portugal	-0.3785		-0.0675
	Romania	-0.1430		-0.1049
	Slovakia	-0.1375		-0.2216
	Spain	-0.2352		-0.0682
	Sweden	-1.4161		-0.9198
	Switzerland	-0.3711		-0.9357
	United Kingdom	-0.1373		-0.0714
FORMER SOVIET UNION	Armenia	-0.1415		-0.0869
	Azerbaijan	-0.1337		-0.0362
	Belarus	-0.1408		-0.0388
	Estonia	-0.3546		-0.1936
	Latvia	-0.1765		-0.0465
	Lithuania	-0.2329		-0.0943
	Georgia	-0.1455		-0.0597
	Kazakhstan	-0.1431		-0.1458
	Kyrgyzstan	-0.3291		-0.0839
	Moldova	-0.1322		-0.0387
	Russia	-0.1178		-0.0492
	Tajikistan	-0.3059		-0.1023
	Turkmenistan	-0.0820		-0.0352
	Ukraine	-0.1206		-0.1414
	Uzbekistan	-0.0645		-0.0367
MIDDLE EAST	Bahrain	-0.0693		-0.0311
	Iran	-0.0825		-0.0348
	Iraq	-0.3125		-0.1564
	Israel	-0.6918		-0.0691
	Jordan	-0.7776		-0.0319
	Kuwait	-0.1150		-0.0630
	Lebanon	-1.6106		-0.2203
	Oman	-0.0764		-0.0329
	Qatar	-0.0560		-0.0310
	Saudi Arabia	-0.1317		-0.0394
	Syria	-0.2573		-0.0410
	Turkey	-0.2536		-0.0511
	UAE	-0.0783		-0.0313
	Yemen	-3.7623		-3.8558
NORTH AMERICA	Canada	-0.1133		-0.1864
	Mexico	-0.2271		-0.0517
	United States	-0.1475	*Residential*	-0.1186
		-0.1218	*Commercial*	
		-0.2201	*Industrial*	

Exhibit R
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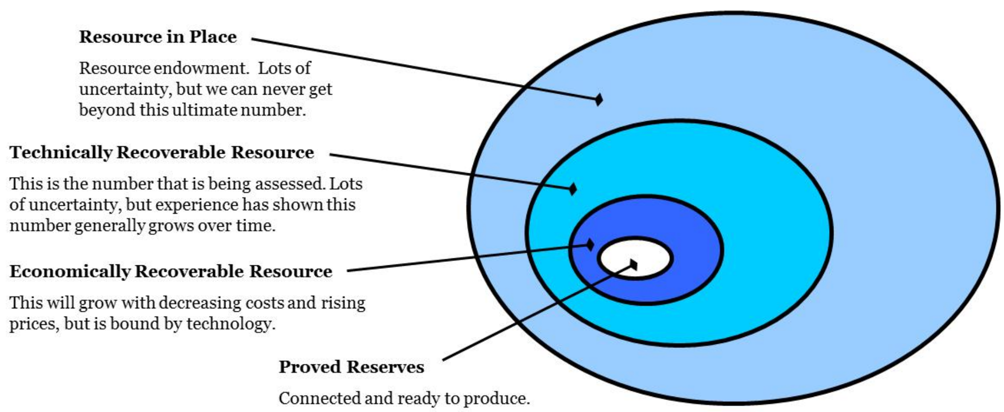
This raises another important point. As a result of the manner in which natural gas demand is estimated as a share of TPER, the price elasticity varies with the share of natural gas in total primary energy. Specifically, as the share of natural gas in total energy approaches zero, the price elasticity rises in absolute value, all else equal. In other words, the natural gas price elasticity of demand is high if a country/region is not currently invested in natural gas-consuming capital. One interpretation of this result from the econometric analysis is that future demand growth in regions where natural gas use is not prevalent would require investment in natural gas-using capital equipment, which would be slow to come if price is high. Moreover, in regions where the natural gas share is already high, natural gas demand has relatively little ability to respond to price because other types of energy-using capital are not prevalent. Table B2 details the short-run price elasticities used in this study. The mid-point elasticities in Table B2 are implied by the estimated equations for the procedure explained above.

Modeling demand in this manner provides flexibility to analyze how different scenarios will impact the demand for natural gas. For example, if the international demand for U.S.-sourced LNG is very high, this acts as an impulse to demand for U.S. natural gas. All else equal, price will be influence upwards, which could crowd out demand from other sectors. However, the extent to which price increases is also a function of the elasticity of domestic supply, which is contingent on domestic resource cost and availability. We now turn our attention to resource quantity and cost assessments in the RWGTM.

B1b. Resources and Production in the RWGTM

Because the RWGTM proves and develops resources, finding and development costs and resource assessments are critical inputs. Both conventional and unconventional resources are characterized across 140 regions into three primary categories: (1) proved reserves, (2) growth in existing fields, and (3) undiscovered resources. Proved reserves and geologic assessments of unproven resources are taken from a number of sources, such as the U.S. Geological Survey (USGS), National Petroleum Council (NPC), Australian Bureau of Agriculture and Resource Economics, and Baker Institute CES research on unconventional resources.

Figure B4. Resources Defined[36]



Production in the RWGTM requires investment in the development of resources, so the finding and development costs of resources are an important input. Even if technically recoverable resources are assessed to be very large, the relevant quantity is the commercially viable subset of what is

[36] Modified from V.E. McKelvey, "Mineral Resource Estimates and Public Policy," *American Scientist* 60, no. 1 (1972): 32–40.

technically recoverable. Technically recoverable resources define the resources that can be recovered with existing technology regardless of cost, whereas economically recoverable resources define what is commercially accessible. Resources that are "proved" are a subset of what is commercially viable, because proved reserves typically refer to resources that can be produced in a relatively short period of time. In sum, large resource in-place estimates do not imply large-scale production will be forthcoming. Productivity improvements, cost reductions, and the price environment all play an important role in defining what is *technically recoverable* and what is *economically recoverable* relative to the *total resource endowment*. Figure B4 illustrates this principle.

North America finding and development (F&D) costs for non-shale resources are based on estimates developed by the NPC in its 2003 report and have been adjusted using data from their 1998–2000 point of reference, using the Bureau of Economic Analysis (BEA) KLEMS database to account for changes in upstream costs, which has varied widely through the years. As explained below, upstream costs are closely correlated to the crude oil and natural gas price environment.

The F&D cost curves are developed by linking data on well development costs to the geologic characteristics of each play in areas where such information is known. The NPC report in 2003 aimed at assessing the future of the North American natural gas market and detailed costs for over 900 plays in North America. That data was utilized to develop an econometric relationship between costs and geology in non-shale resources. Then, the statistically derived information was used to generate costs (via an "out of sample" fit) in regions around the world where geologic characteristics are known, but costs are not. In other words, costs have been econometrically related to play-level geologic characteristics and applied globally to generate costs for all regions of the world. The methodology employed for non-shale gas resources is outlined in detail in Hartley and Medlock (2006).[37]

A note on the long-run cost environment assumed in the RWGTM is important here. In general, upstream costs rise and fall over time. The RWGTM Reference case assumes the cost environment drifts to a long-run average level. Analyzing data available from the KLEMS database from the BEA on the real cost of oil and gas extraction, we are able to differentiate a long-run average cost from short-term peaks and valleys. Of course, there are uncertainties regarding this approach, and although not explicitly addressed in this study, we have executed scenarios in the RWGTM assuming different long-run cost levels. However, an underlying assumption that costs do not change can cement the myopia that is often present in forecasting.[38]

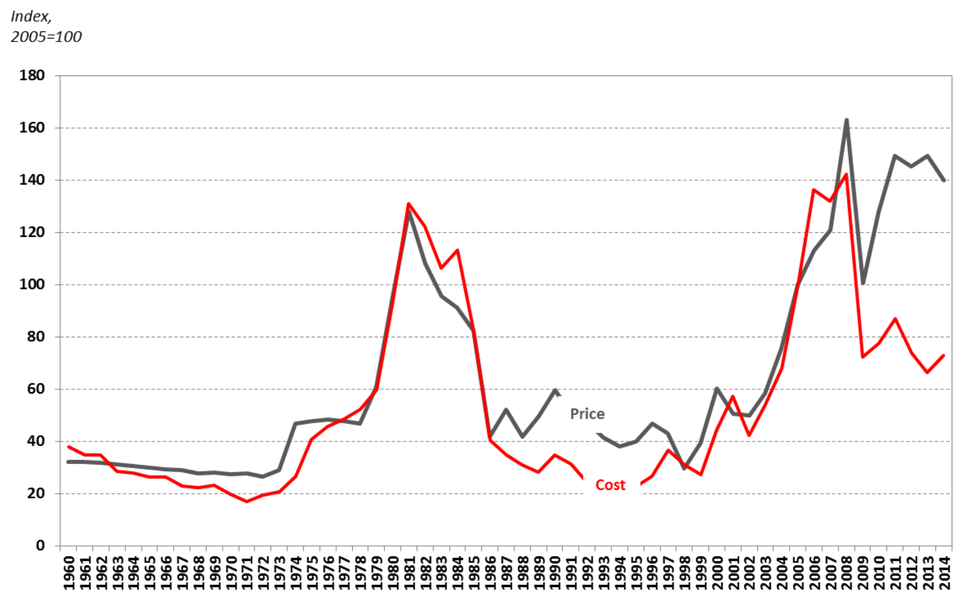
Figure B5 graphs an index of development costs and the price of oil, each in real 2010 values having been adjusted using the GDP deflator. Notably, the two indices generally move together, but neither is a clear leading indicator of the other. This general pattern supports the notion that in some periods costs rise due to "demand pull" occurring when high energy prices encourage greater upstream investment activity, while in other periods price rises due to "cost push" when scarcity of raw materials and qualified personnel drive up development costs.[39] In either case, the cost environment is germane to market conditions, so what one assumes going forward will be very important for the projected time horizon.

[37] Peter Hartley and Kenneth B. Medlock III, "The Baker Institute World Gas Trade Model" in *Natural Gas and Geopolitics: 1970–2040*, ed. David Victor, Amy Jaffe, and Mark Hayes, Cambridge University Press (2006).

[38] Based on unpublished analysis as part of CES sponsored research, the *QP-Rice International Natural Gas Program*.

[39] Certainly, the latter point has been a concern in the oil and gas industry for the better part of the last two decades. Often referred to as "the great crew change," a graying industry has seen a diminishing availability of qualified individuals to operate technically complex oil and gas mining operations.

Figure B5. Real Development Costs and the Real Price of Oil (1968–2014)



Source: U.S. Bureau of Economic Analysis; U.S. Energy Information Administration

While the average long-run cost is assumed to be the average of the cost levels over the last 25 years, which is generally consistent with a real oil price (in 2010$) of just under $80 per barrel, short-run pressures are allowed to increase costs in any given year above the long-run level. These so-called "short-run adjustment costs" raise F&D costs above their long-run level when development activity rises within a given year. Thus, if a particular scenario in the RWGTM involves, for example, an unexpected demand shock, both short-run cost and price will rise as development activity ramps up to respond.

The RWGTM also contains detailed estimates of resource quantities and development costs for shale resources around the world. The initial assessments of technically recoverable shale resources are taken from the report "Technically Recoverable Shale Oil and Gas Resources: An Assessment of 137

Shale Formations in 41 Countries Outside the United States" by Advanced Resources International for the U.S. Energy Information Administration in June 2013.[40] In developing F&D curves for shale, we also used data from the report "Review of Emerging Resources: U.S. Shale Gas and Shale Oil Plays" by INTEK, Inc. for the EIA in July 2011,[41] as well as shale gas well production data across regions in the United States collected from DrillingInfo.com.

Geophysical data and well performance data are used to generate finding and development cost curves for an average shale gas well in every assessed basin. Specifically, the *average* expected ultimate recovery (EUR) for play *i* is found using the following relationship

$$\underbrace{EUR_{i,avg}}_{\frac{X}{YZ}\ bcf/well} = \underbrace{TRR_i}_{X\ bcf} / \underbrace{\left(Area_i \cdot WellSpacing_i\right)}_{Y\ miles^2 \cdot Z\ well/miles^2}$$

where the relevant data are taken from the aforementioned ARI report for international locations. For domestic shales the average EUR, and the distribution of EURs, is taken from the INTEK report. The distribution of EURs is fit to the INTEK data for each shale play by estimating

$$EUR_{i,p} = a\ln\left(p\right) + b$$

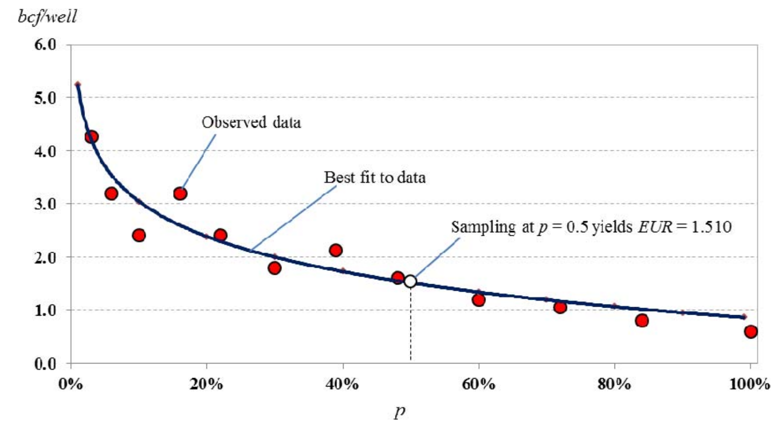
where p is the probability of a well's EUR being less than $EUR_{i,p}$. For example, in the Barnett shale we estimate the relationship above to find

$$EUR_{Barnett,p} = -0.9520\ln\left(p\right) + 0.8501$$

[40] Available at http://www.eia.gov/analysis/studies/usshalegas/pdf/usshaleplays.pdf.
[41] Available at http://www.eia.gov/analysis/studies/usshalegas/pdf/usshaleplays.pdf.

with $R^2 = 0.9118$.[42] This equation then allows us to "sample" at any *p* to obtain an EUR. Figure B6 illustrates this procedure.

Figure B6. Estimating EURs for Known Shale Plays



Next, we determine the cost per unit at each EUR as

$$\underbrace{Cost\ per\ unit_{i,p}}_{\frac{X}{Y}\ \$/mcf} = \underbrace{F\ \&\ D_i}_{X\ million\$/well} \ / \underbrace{EUR_{i,p}}_{Y\ bcf/well} .$$

Specifically, we determine the average per unit cost for each 20th percentile by: (1) assuming wells can be drilled uniformly in available acreage across the areal extent of the shale, (2) sampling from the EUR distribution and determining the total resource in each percentile of the distribution, then (3) taking a volume weighted average of the per unit costs at each percentile in the distribution. Similar steps were taken for every shale play in the United States. Then, the parameters describing the distribution of shale gas well performance for plays in the United States are used to derive EUR

[42] The regressions for the other shales in the United States also fit the data very well, with R^2 ranging between 0.9101 and 0.9963.

distributions for shales around the world. This allows us to "tier" the resources according to cost for every shale in the world.

Where available, we use published data on full cycle finding and development costs. However, this is not available for every location in the world. As such, we estimate drilling costs ($F\&D_i$) as a function of depth and pressure

$$F\,\&\,D_i \;=\; \underset{(0.8941)}{0.8616} \;+\; \underset{\left(9.0041\times10^{-5}\right)}{3.6605\times10^{-4}}\,TVD_i + \underset{(1.8606)}{3.2192}\,Pressure_i$$

with $R^2 = 0.9016$. Thus, for example, a horizontal well with total vertical depth of 4,000 feet and pressure gradient of 0.5801 psi/ft^2 is estimated to cost \$4.19 million. If EUR is 2.5 Bcf/well, then the cost per mcf is estimated to be \$1.67/mcf. Of course, a return must be earned on capital, and operating costs must also be covered, which is how we arrive at an estimated breakeven cost for the average well in this example. Of course, the income tax rate, severance tax, royalties, and other relevant parameters also come into the calculation when determining the breakeven price. Using the average set of values for these parameters in the RWGTM for the United States would put the breakeven price for this example at \$5.96/mcf. Taking things a step further, this approach allows an evaluation of the relative competitiveness of resources across regions under different tax regimes.

Unless otherwise stated in a specific scenario, we honor "above ground" constraints, such as fracturing moratoria in places like France and the State of New York. Other issues also present impediments to development. For instance, the lack of a well-developed service industry or lack of a competitive upstream sector can raise costs relative to what is seen elsewhere. As a result, costs are higher in these places, with the inputs benchmarked against publically reported well costs. In addition, in countries such as China, water availability for hydraulic fracturing may raise costs and even severely restrict the shale gas potential to varying extents in different basins. Despite constraints faced in some regions due to water scarcity, it is possible that breakthroughs in the use of brackish water from deep-source aquifers, top-side water recycling capability, and/or the use of super-critical nitrogen or liquefied petroleum gas (LPG) to fracture shale will make much of the resource more viable at some point in the future. In the RWGTM, we do not assume any such technological breakthroughs, unless otherwise stated in a particular scenario, so shale development costs are typically higher in regions affected by water shortages as a result.

Figures B7 and B8 indicate the breakeven curves, inclusive of fiscal terms and return to capital, for shale in North America and around the world. The data are also presented in a table in Annex D. One should not interpret the graphs in Figures B7 and B8 as classical long-run supply curves. Rather, they are only *illustrative* of cost largely because the resources are geographically dispersed. Aggregating them ignores transportation costs to a generally accepted pricing location, and the transportation costs are heterogeneous across resources. A prime example is highlighted in the graph for "EUROPE and FSU" in Figure B8. Here, Russian shale is identified (tiers 1 through 4 of the Bazhenov shale to be specific; tier 5 breakeven exceeds $20 so is not illustrated). In order for this resource to be commercially viable in Western Europe, it would need to be transported a long distance via pipeline. Therefore, to a consumer in Europe, a breakeven of just under $5 per mcf is not very relevant because upon including transport costs, that Russian shale is not competitive with several tier 1 shales in Western Europe.

Figure B7. Shale Breakeven Curves for North America by Country

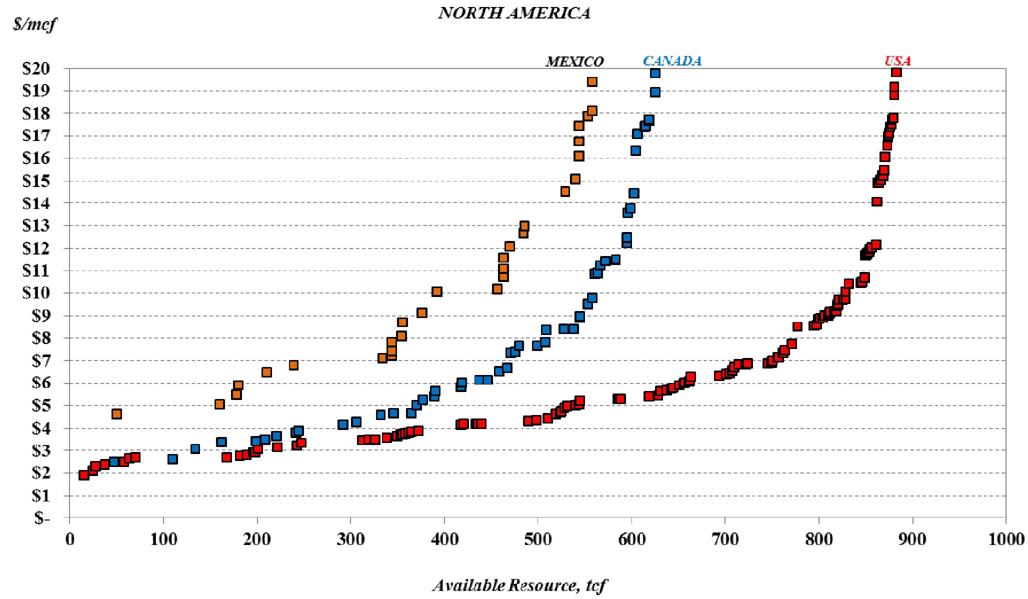
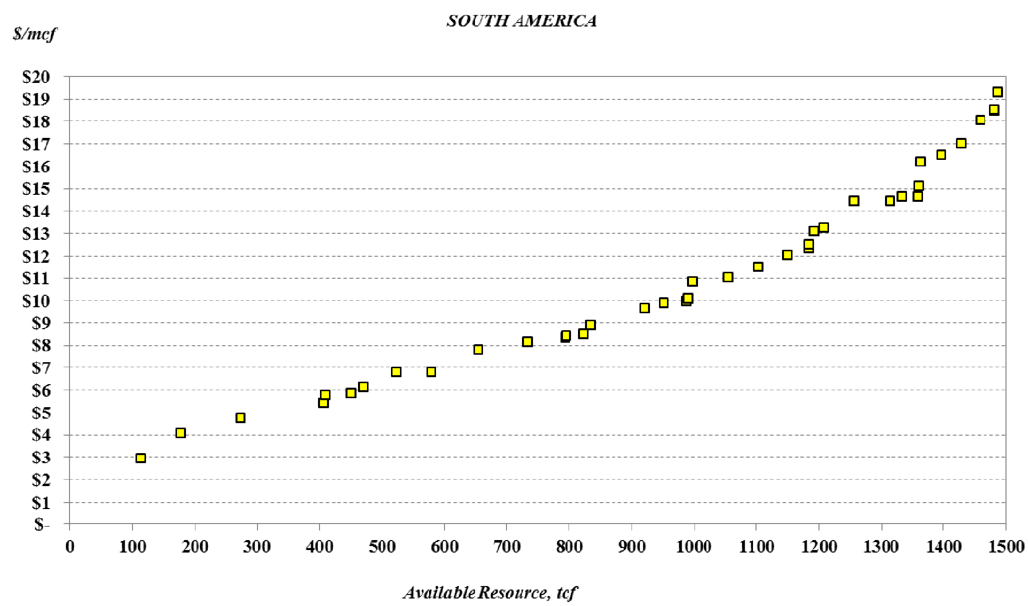
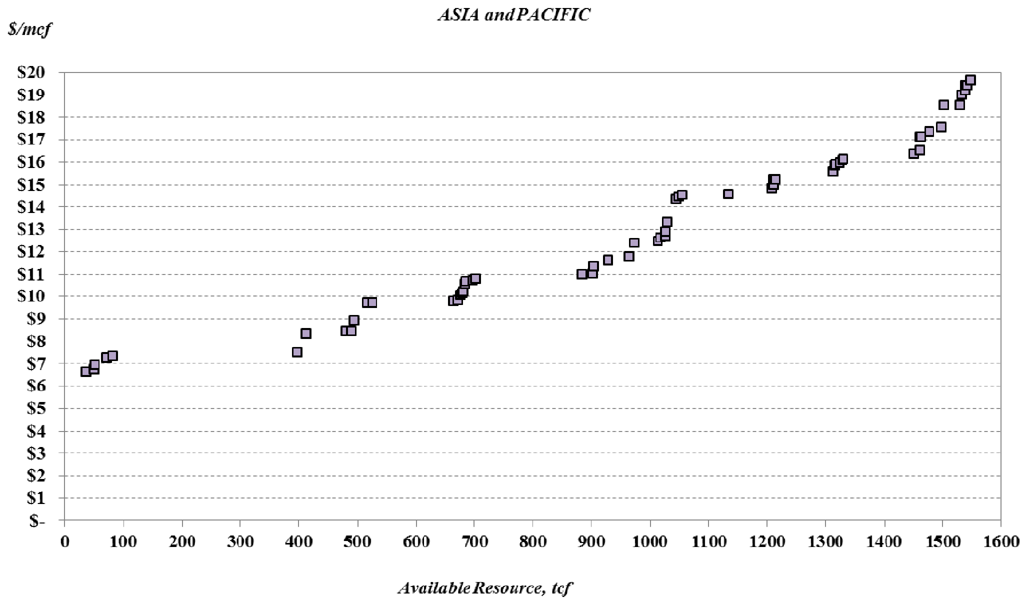
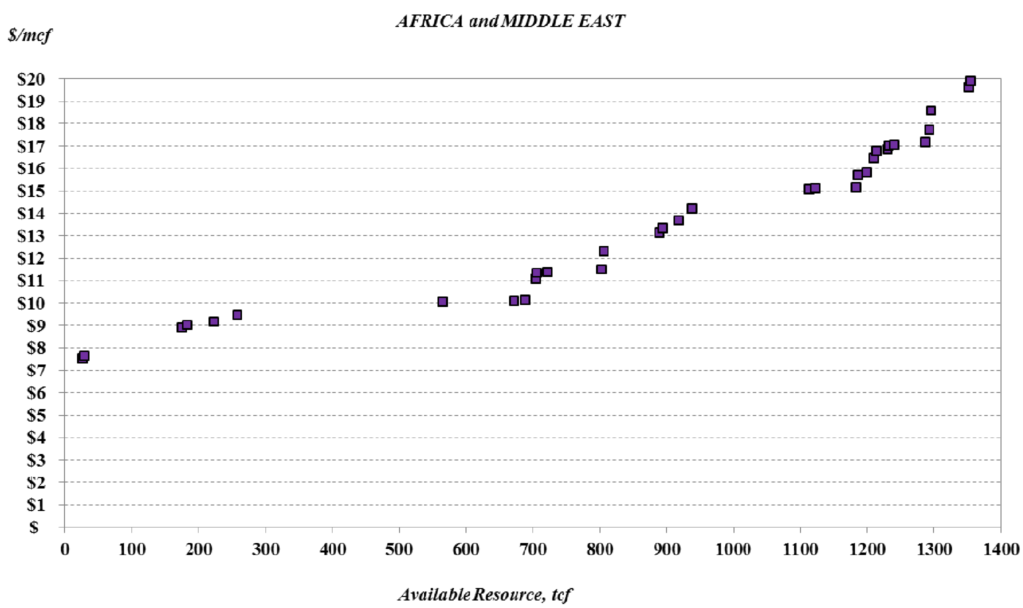


Figure B8. Shale Breakeven Curves for Regions Outside North America







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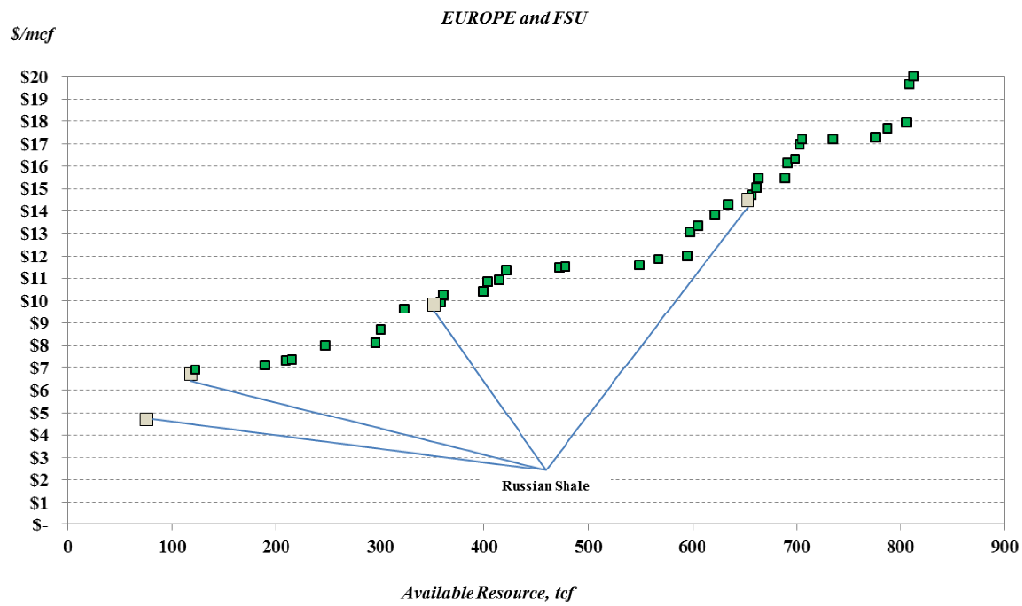


Many factors influence cost and productivity, which leads to tremendous heterogeneity. For example, shale that is clay-rich is generally not prone to high production rates, which in turn tends to reduce its commercial attractiveness even if the technically recoverable resource assessment is large. Other factors—such as total organic carbon, natural fracturation, isopach, permeability, porosity, and other features—are also critical, which makes the degree of complexity involved in developing cost curves for undeveloped shale resources very high thus imbedding a significant degree of uncertainty.

We must also recognize that estimates of shale gas resources will change over time as more is learned about each play. In addition, as new imaging technologies and new extraction processes are developed, assessments for *economically* recoverable shale gas could increase, particularly as technical advances drive improvements in productivity. As such, estimates of productivity improvement can be important and have significant impacts on upstream activity and price. We allow technical improvements in shale extraction throughout the model time horizon, approaching an overall cost reduction of 10 percent at a rate of 2 percent per year. In the various scenarios considered in this study, we vary shale resource availability to be both higher and lower in the United States and other parts of the world in order to motivate demand for and availability of U.S.-sourced LNG.

As indicated to above, factors other than technical advances can alter development costs. Specifically, various regulatory, policy, and market factors can contribute to heterogeneity in costs. As outlined in Medlock (2014b), geology is a *necessary* condition for successful upstream development, but it is far from *sufficient*, and the recent growth in production in the United States owes to a very unique set of circumstances, including:

- A regulatory and legal apparatus in which upstream firms can negotiate directly with landowners for access to mineral rights on privately owned lands.
- A market where liquid pricing locations, or hubs, are easily accessed due to liberalized transport services that dictate pipeline capacity is unbundled from pipeline ownership.
- A well-developed pipeline network that can facilitate new production volumes as they are brought online.
- A market in which interstate pipeline development is relatively seamless due to a well-established governing body, i.e., the Federal Energy Regulatory Commission (FERC), and a comparatively straightforward regulatory approval process.

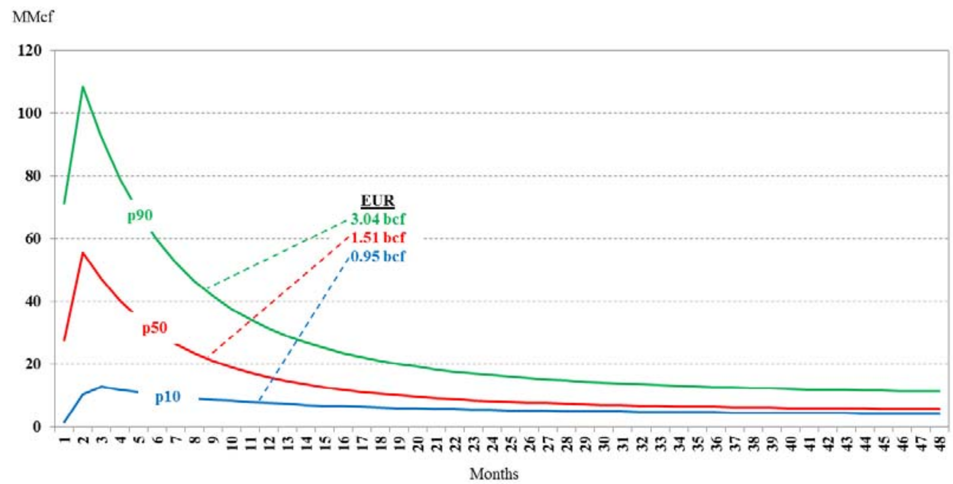
- A market in which demand pull is sufficient, and can materialize with minimal regulatory impediment, to provide the opportunity for new supplies to compete against other supplies or energy sources for market share.
- A market where a well-developed service sector already exists that can facilitate fast-paced drilling activity and provide rapid response to demands in the field.
- A service sector that strives to lower costs and advance technologies in order to gain a competitive advantage.
- A rig fleet that is capable of responding to upstream demands without constraint.
- A deep set of upstream actors—independent producers—that behave as "entrepreneurs" in the upstream, thereby facilitating a flow of capital into the field toward smaller-scale, riskier ventures than those typically engaged by vertically integrated majors.

Many of the above factors are unique to the United States, and their absence in other parts of the world can serve to raise the cost of developing shale (and other) resources. For example, in the absence of a robust upstream sector capable of handling the large-scale demands of shale gas development, scarcity constraints (on labor, rigs, and equipment) can become binding. This has been evidenced in places like Poland, for example, where drilling costs are roughly double those seen for shale production targets at similar depths in the United States. This, all else equal, requires those wells to be about twice as productive to stand on the same commercial footing as a similar well in the United States. However, if upstream activity ramps up in these regions, the availability of rigs, personnel, and equipment should increase. This would, with the development of a deeper supply chain bring costs down. We capture this in the RWGTM by allowing current costs around the world to approach the costs seen in the United States. The transition is parameterized by a learning function that allows costs to fall asymptotically to costs that would be representative of similar activities in the United States.[43] Absent resource development, however, costs remain at their initial higher levels.

Characterizing shale gas decline curves is a very important matter when modeling potential production. The models of physical flow through porous media that are the basis for the classically accepted Arps' equations do not fit observed production data for shale gas wells. Patzek, Male, and Marder (2014) developed an alternative descriptor of decline curves for shale based on the physics of fluid flow in ultralow permeability, ultralow porosity rock media, such as shale. Their analysis resulted in a hypothesis that shale gas wells should decline so that production is inversely proportional to the square root of time. Medlock and Seitlheko (2015) subsequently tested this hypothesis by linearizing their postulated decline curve and econometrically fitting it to a panel of over 16,000 wells in the Barnett shale. They could not reject the hypothesis of Patzek, Male, and Marder at a very high level of significance. This, in turn, allows for the construction of "type" curves, and allows a characterization of the distribution of well performances, which is depicted below in Figure B9 for the Barnett shale.

[43] So, if shale-directed activity in Poland were to increase significantly, the cost to drill a well with vertical depth of 8,500 feet that currently costs just over $16 million would fall over the course of a decade to approach $9 million.

Figure B9. Barnett Shale "Type" Well Decline



Source: Reproduced from Medlock and Seitlheko (2015)

Of particular note in Figure A9 is the fact that the EUR can vary substantially within a play. This, of course, has implications for the economic viability of each well and is a core component in the construction of the productivity tiers discussed above. Importantly, when assessing the long-term potential of a play, individual well economics do not convey the complete story. Virtually every operator has a portfolio of acreage and wells, and the performance of the portfolio is what determines commercial success. As drilling commences, a tremendous amount of information is gathered at the play and the acreage that has the greater proportion of high-performing wells—the so-called "sweet spots"—become better identified. Operators will turn their focus to those regions over time, especially if price is expected to be low. As this occurs, fewer wells are needed to maintain a given play-level production volume because each subsequent well is more productive. This "learning-by-doing" process results in an observed play-level productivity improvement. Importantly, however, this is distinctly different from technologically-driven productivity improvements, which generally tend to lift productivity of all wells regardless of location.

B1c. Other Model Attributes

In the RWGTM, events in one region of the world—economic, political, or otherwise—influence all other regions because commodity movement via pipelines and/or LNG tankers connects markets and transmits both physical commodity volumes and price signals. The costs of constructing new pipelines and LNG facilities in the RWGTM are estimated using data from previous and potential projects available from the Energy Information Administration, International Energy Agency (IEA), and various industry reports. Within the United States, Federal Energy Regulatory Commission (FERC)-filed tariff rates determine pipeline transportation costs. Transportation costs for regions outside the United States are determined by a rate-of-return calculation on existing infrastructure or are based on information obtained from various industry reports, where such information is available.

The transportation infrastructure is characterized to a fine level of detail, reflecting the geographic detail of supply and demand represented in the model. The infrastructure representation in the RWGTM for the U.S. natural gas market replicates interstate and intrastate pipeline networks with great detail. In fact, as noted above, in the lower 48 states there are over 100 demand regions characterized by industrial, power generation, residential, commercial, and transportation demand, with each of these demands connected to supply sources by a highly detailed representation of the North American pipeline network. More generally, the degree of regional detail around the world varies according to the density of pipeline infrastructure and the size of local demand centers.

The RWGTM balances supply and demand through spatial optimization along a given transportation network within a time period, while using intertemporal dynamic optimization to prove resources and develop infrastructure across time periods. This, as noted earlier, allows the model to eliminate all spatial and intertemporal arbitrage opportunities. In other words, the model solves for the optimal investment pathway—through field level upstream development, pipeline construction and utilization, and LNG value chain development and use—to balance supply and demand in each location. This allows us to construct scenarios that consider the effects of different economic and/or geopolitical assumptions on investment and trade.

B2. The Oxford Global Economic Model

Oxford's Global Economic Model (GEM) is the world's leading globally integrated macro model, used by over 100 clients around the world, including finance ministries, leading banks, and blue-chip companies.

The GEM covers 46 countries, including the United States, Canada, the EU, and major emerging markets including China and India. The model provides a rigorous and consistent structure for analysis and forecasting, and allows the implications of alternative global scenarios and policy developments to be analyzed at both the macro and sector level.

Theoretical motivations

Broadly speaking, there are three types of macroeconomic model designed to help economists in forecasting and analysis of the impacts of alternative economic scenarios and policies. At one extreme, there are the purely statistical models known as vector autoregressions (VARs). Their strengths are short-term forecasting (usually six months to a year or so) and the generation of stylized facts. However, they are much less useful for longer-term forecasting and, because they lack any economic structure, they cannot be used for policy analysis.

At the other extreme are the so-called computable general equilibrium models (CGEMs) such as dynamic-stochastic general equilibrium (DSGE) models. These models' equations are derived by assuming private agents solve dynamic optimization problems, and they typically do not have error terms, or residuals, like econometrically-estimated relationships. They are calibrated so that in equilibrium they reproduce historical averages of key macro variables. Their strength is their high degree of rigour, but when econometricians perform statistical tests on them, they typically do badly relative to the traditional models.

The Oxford Economics Global Economic Model (GEM) takes a third approach, which draws elements from both VAR and DSGE models. The GEM is a large-scale macroeconometric model: like a VAR model, behavioral equations in the GEM are estimated using statistical regressions on observable data; the choice of which variables to include in the equations, however, are drawn from economic theory. The main advantage of the macroeconometric approach is that it provides both a forecasting tool and a tool for policy analysis.

Model form, parameter estimation and calibration

The GEM is an error correction model, a form of a multiple time series model that estimates the speed at which a dependent variable returns to its equilibrium after a shock to one or more independent variables. This form of model is useful as estimating both the short and long run effects of variables on the given variable in question. The GEM exhibits ‘Keynesian’ features in the short run. Factor prices are sticky and output is determined by aggregate demand. In the long-run, its properties are Neoclassical, such that prices adjust fully and the equilibrium is determined by supply factors – productivity, labor and capital – and attempts to raise growth by boosting demand only leads to higher prices.

This explicit division into short and long components does not imply that the long-term steady state solution is independent of the short-term drivers. Rather, the error correction format introduces a feedback loops such that short-run deviations from the equilibrium adjust back to the steady state. In other words, an error correction model combines the long-run equilibrium relationship implied by co-integration with the short run dynamic adjustment mechanism that describes how the variables react when they move out of long-run equilibrium. Intuitively, if forecasts are derived using observed data, then significant and persistent deviations from the historical trend would suggest a change in the underlying drivers of an economic phenomenon.

The GEM is a disaggregated empirical model where behavioral equations are estimated on observable data. Individual country models, and the six regional models which complete the world coverage of the Oxford Global Economic Model, are estimated using the previously described error correction format. Economic theory is used to determine appropriate explanatory variables for behavioral relationships such as prices, exchange rates, productivity, and employment.

Coefficients on behavioral relationships which cannot be estimated using econometric regressions are calibrated using proxy series, established economic theory, or imposed to obtain consistency with an observed empirical relationship. The different approaches for determining coefficients are largely driven by the availability and quality of underlying data. Coefficients on variables in the long-run are imposed using theory, for example the permanent income hypothesis as a driver of long-run consumption.

Overview of country models in the Global Economic Model

The structure of each of the country models is based on the income-expenditure accounting framework. However, the models have a coherent treatment of supply. In the long run, each of the economies behaves like the classic one sector economy under Cobb-Douglas technology. Countries have a natural growth rate, which is determined by capital stock, labor supply adjusted for human capital, and total factor productivity. Output cycles around a deterministic trend, so the level of potential output at any point in time can be defined, along with a corresponding natural rate of unemployment.

Firms are assumed to set prices given output and the capital stock, but the labor market is characterized by imperfect competition. Firms bargain with workers over wages but choose the optimal level of employment. Under this construct, countries with higher real wages demonstrate higher long-run unemployment, while countries with more rigid real wages demonstrate higher unemployment relative to the natural rate.

Inflation is a monetary phenomenon in the long run. All of the models assume a vertical Phillips curve, so expansionary demand policies place upward pressure on inflation. Unchecked, these pressures cause an unbounded acceleration of the price level. Given the negative economic consequences of this (as seen in the 1970s in developed economies and more recently in some emerging markets), most countries have adopted a monetary policy framework which keeps inflation in check. The model mirrors this, by incorporating endogenous monetary policy. For the main advanced economies, monetary policy is underpinned by the Taylor rule, captured using an inflation target, such that interest rates are assumed to rise when inflation is above the target rate, and/or output is above potential. The coefficients in the interest rate reaction function, as well as the inflation target itself, reflect assumptions about how hawkish different countries are about inflation. A by-product of this system is that scenarios under fixed interest rates only make sense in the short-run. A scenario which imposes a fixed interest rate, and therefore assumes a lack of monetary policy, in conjunction with a vertical Phillips curve, would result in accelerating (or decelerating) inflation after several years.

Demand is modeled as a function of real incomes, real financial wealth, real interest rates and inflation. Investment equations are underpinned by the Tobin's Q Ratio, such that the investment rate is determined by the return relative to the opportunity cost, adjusted for taxes and allowances. Countries are assumed to be "infinitely small", in the sense that exports are determined by aggregate demand and a country cannot ultimately determine its own terms of trade. Consequently, exports are a function of world demand and the real exchange rate, and the world trade matrix ensures adding-up consistency across countries. Imports are determined by real domestic demand and competitiveness.

Finally, the model assumes adaptive rather than forward looking expectations because we believe that introducing expectations on the basis of economic theory is more advantageous than using the forward looking assumption ubiquitously. There is disagreement among economists about whether forward looking expectations are consistent with observed data, which become even more acute in light of the difficulties with obtaining accurate data on expectations for model-building purposes. Instead, we adopt adaptive expectations, which are introduced using a framework in which expectations are formed using the actual predicted values from the model. Exogenous variables are assumed to be known a priori. Where appropriate, the model does introduce expectations implicitly and explicitly, therefore accounting for how and extent to which agents respond to information about changes in fundamentals. An example of this includes our derivation of exchange rate forecasts which implicitly capture expectations: in the short-run, the exchange rate is driven by movements in domestic interest rates relative to the United States, therefore accounting for uncovered interest rate parity. Another example is our use of a variable for forward guidance to capture expected movements in interest rates.

Linkages between economies

Individual country models within the GEM are linked in a number of ways:

- Trade (Exports driven by weighted matrix of trading partners' import demand)
- Competitiveness (IMF relative unit labor costs where available, relative prices elsewhere)
- Interest Rates and Exchange Rates
- Commodity Prices (e.g. oil, gas and coal prices depend on supply/demand balance; metal
- prices depend on growth in industry output)
- World Price of Manufactured Goods

Link to sector/industry output

In addition, the Global Economic Model links to the Global Industry Model to break-down of value added and employment by sector. Consistency between the income-expenditure and value-added approaches to output is ensured by scaling value added in each sector up or down to obtain expenditure-based value added as the sum of value added in the sectors.

The sector breakdown reflects the input-output structure of each economy. For each sector we calculate the total demand for that sector as a weighted average of value added in other sectors and final expenditure, with the weights taken from input-output tables. We then use total demand to estimate the value added for that respective sector since in the long run (everything else equal) value added and demand must grow in line with each other. Value added is also affected by competitiveness (measured by relative unit labour costs) to a degree that reflects the international openness of each sector. Employment by sector is derived from value added in that sector and sector-specific productivity trends. As in the case of value added, consistency between the total employment forecast and employment in all sectors is achieved by scaling the sector employment variables up or down.

At the country level, the model's structure is Keynesian in the short run, with output driven by shifts in demand, but in the long run the model is neoclassical, and GDP is determined by the economy's supply-side potential (i.e., the level of output is determined by an economy's labor supply, capital stock, and productive potential). For example, increased demand will lead to higher output and employment initially, but eventually that feeds through into higher wages and prices. Given an inflation target, interest rates have to rise, reducing demand again ("crowding out"). As a result, output returns to its potential level over the long run.

Overview of the Global Economic Model
Consumption—function of real income, wealth, and interest rates
Investment—"q" formulation with accelerator terms
Exports—depend on world demand and relative unit labor costs
Imports—depend on total final expenditure and competitiveness
Real wages depend on productivity and unemployment relative to NAIRU
Prices are a markup on unit costs, with profits margins a function of the output gap
Monetary policy endogenized; options include Taylor rule, fixed money and exchange rate targeting
Exchange rate determined by UIP
Expectations adaptive

At the global level, countries are linked through trade, financial variables, and commodity prices. As a result, the model is able to capture both the direct and indirect impacts of changes in the global natural gas market. The output of the GEM is then the dynamic impact on GDP, interest rates, employment, inflation, and other macro variables.

B3. The Oxford Economics Global Industry Model

Linked to the Global Economic Model is the Oxford Economics Global Industry Model. This model, based upon standard industrial classifications and updated quarterly, has a detailed breakdown of output by sector across 100 sectors and 67 countries. The model includes a particularly detailed breakdown in the manufacturing sector, covering eight key sectors: metals, chemicals, motor vehicles, engineering and metal goods, electronics and computers, textiles and clothing, aerospace, and other intermediate goods. The GIM generates forecasts for both gross output and gross value added (output excluding intermediate consumption).

Forecasts for individual industries are driven by the macroeconomic forecast from the GEM combined with our detailed model of industry interactions. Demand from households, firms, and government is allocated to individual industries using weights based upon national input-output tables. These tables show the percentage of each industry’s output that is driven by consumption, investment, exports, and intermediate demand. So, for example, a forecast of economic growth led by strong investment will lead to rapid growth in capital goods sectors. Furthermore, sectors that supply those industries will also benefit through supply-chain linkages (i.e., intermediate levels of demand) also captured in the model. Finally, the industry model takes into account the impacts of changes in competitiveness of a sector’s market share both domestically and overseas.

Annex C Scenario Results Tables

Table C1. Impact of Increasing LNG Exports, Annual Avg. Change from 12 Bcf/d, 2015–2040*

	12 Bcf/d to 20 Bcf/d LNG Exports		12 Bcf/d to Market-Determined (endogenous) LNG Export Level			
	Reference	High Resource Recovery	Reference	High Resource Recovery	Low Resource Recovery	High Natural Gas Demand
U.S. Natural Gas Market (Bcf/d)						
NG Production	3.5	4.9	4.6	8.1	2.3	3.8
	2.3%	*3.0%*	*2.9%*	*4.9%*	*1.6%*	*2.3%*
NG Consumption	0.1	0.2	0.0	0.4	-0.1	0.0
	0.0%	*0.2%*	*0.0%*	*0.3%*	*0.0%*	*0.0%*
NG Exports	4.2	5.1	5.3	8.5	2.6	4.2
	16%	*18%*	*20%*	*30%*	*11%*	*16%*
NG Imports	0.8	0.4	0.8	0.8	0.2	0.5
	3.0%	*1.9%*	*3.1%*	*3.5%*	*0.9%*	*1.9%*
Prices (2010$)						
Henry Hub Price	$0.17	$0.15	$0.20	$0.25	$0.12	$0.18
	3.3%	*3.4%*	*4.0%*	*5.6%*	*2.0%*	*3.4%*
NBP (UK)	$0.00	-$0.01	$0.01	-$0.03	-$0.01	-$0.01
	0.0%	*-0.1%*	*0.1%*	*-0.3%*	*-0.1%*	*-0.1%*
German Border (NW Europe)	$0.00	$0.00	$0.01	-$0.01	-$0.01	$0.00
	0.0%	*0.0%*	*0.1%*	*-0.1%*	*-0.1%*	*0.0%*
JKM (Asia-Pacific)	-$0.73	-$0.89	-$0.89	-$1.31	-$0.50	-$0.71
	-4.9%	*-6.0%*	*-6.0%*	*-8.8%*	*-3.3%*	*-4.8%*
Macroeconomic Impacts						
GDP (annual avg., 2014$B)	$3.8	$4.1	$8.5	$11.1	$6.7	$7.4
	0.02%	*0.02%*	*0.03%*	*0.04%*	*0.03%*	*0.03%*
Employment (000s)	3.0	5.6	10.6	17.2	8.6	7.8
	0.00%	*0.00%*	*0.01%*	*0.01%*	*0.01%*	*0.00%*
CPI (level)	0.16%	0.20%	0.19%	0.30%	0.08%	0.16%
Current Account (% of GDP)	0.02	0.03	0.03	0.05	0.02	0.03
Sector Value-Added:						
Manufacturing	0.01%	0.01%	0.03%	0.04%	0.02%	0.02%
EIS	0.00%	0.01%	0.01%	0.02%	0.01%	0.01%
Non-EIS	0.01%	0.01%	0.03%	0.04%	0.03%	0.03%
Agriculture	0.01%	0.01%	0.01%	0.02%	0.01%	0.01%
Extraction	1.00%	1.36%	1.30%	2.23%	0.67%	1.03%
Construction	0.09%	0.09%	0.15%	0.19%	0.10%	0.13%
Services	-0.01%	-0.01%	-0.01%	-0.01%	0.00%	0.00%

***The % rows in this table represent the annual average % difference for the specified time period, between the scenario in question and the 12Bcf/d equivalent – so the % show the percentage equivalent of the change in Bcf/d, US$, '000s, etc.**

Table C2. Impact of Increasing LNG Exports, Annual Avg. Change from 12 Bcf/d, 2015–2025*

	12 Bcf/d to 20 Bcf/d LNG Exports		12 Bcf/d to Market-Determined (endogenous) LNG Export Level			
	Reference	High Resource Recovery	Reference	High Resource Recovery	Low Resource Recovery	High Natural Gas Demand
U.S. Natural Gas Market (Bcf/d)						
NG Production	-0.2	-0.1	-0.2	-0.3	-0.1	-0.3
	-0.3%	*-0.2%*	*-0.4%*	*-0.4%*	*-0.2%*	*-0.4%*
NG Consumption	-0.1	0.0	-0.1	-0.1	-0.1	-0.2
	-0.1%	*0.0%*	*-0.1%*	*-0.1%*	*-0.1%*	*-0.2%*
NG Exports	-0.1	0.0	-0.1	0.0	0.0	-0.1
	-1%	*0%*	*-1%*	*0%*	*-1%*	*-1%*
NG Imports	0.1	0.1	0.1	0.1	0.0	0.1
	0.9%	*1.0%*	*0.9%*	*1.4%*	*0.4%*	*0.6%*
Prices (2010$)						
Henry Hub Price	$0.17	$0.15	$0.20	$0.25	$0.12	$0.18
	0.6%	*0.4%*	*0.9%*	*0.8%*	*0.4%*	*0.8%*
NBP (UK)	$0.00	-$0.01	$0.01	-$0.03	-$0.01	-$0.01
	0.0%	*-0.1%*	*0.1%*	*-0.3%*	*-0.1%*	*-0.1%*
German Border (NW Europe)	$0.00	$0.00	$0.01	-$0.01	-$0.01	$0.00
	0.0%	*0.0%*	*0.1%*	*-0.1%*	*-0.1%*	*0.0%*
JKM (Asia-Pacific)	-$0.73	-$0.89	-$0.89	-$1.31	-$0.50	-$0.71
	-4.9%	*-6.0%*	*-6.0%*	*-8.8%*	*-3.3%*	*-4.8%*
Macroeconomic Impacts						
GDP (annual avg., 2014$B)	-$1.6	-$0.3	-$2.6	-$1.7	-$1.4	-$2.2
	-0.01%	*0.00%*	*-0.01%*	*-0.01%*	*-0.01%*	*-0.01%*
Employment (000s)	2.9	5.4	10.2	16.5	8.3	7.5
	0.00%	*0.00%*	*0.01%*	*0.01%*	*0.01%*	*0.00%*
CPI (level)	0.01%	0.01%	0.02%	0.02%	0.01%	0.02%
Current Account (% of GDP)	0.02	0.03	0.03	0.05	0.02	0.03
Sector Value-Added:						
Manufacturing	-0.01%	0.00%	-0.01%	0.00%	-0.01%	-0.01%
EIS	-0.01%	0.00%	-0.01%	-0.01%	-0.01%	-0.01%
Non-EIS	0.00%	0.00%	-0.01%	0.00%	-0.01%	-0.01%
Agriculture	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Extraction	-0.13%	-0.08%	-0.15%	-0.17%	-0.10%	-0.18%
Construction	-0.01%	0.00%	-0.02%	0.00%	-0.01%	-0.01%
Services	0.00%	0.00%	-0.01%	0.00%	0.00%	-0.01%

***The % rows in this table represent the annual average % difference for the specified time period, between the scenario in question and the 12Bcf/d equivalent – so the % show the percentage equivalent of the change in Bcf/d, US$, '000s, etc.**

Annex D RWGTM Results (Price, Demand, Supply, and LNG Trade)[44]

D1. Natural Gas Prices (2010$/mmBtu)[45]

		2005	2010	2015	2020	2025	2030	2035	2040
Henry Hub	Ref_Ref	$ 8.79	$ 4.39	$ 3.28	$ 4.62	$ 5.30	$ 5.79	$ 6.66	$ 7.42
	Ref_HRR	$ 8.79	$ 4.39	$ 3.19	$ 4.23	$ 4.93	$ 5.07	$ 5.62	$ 6.15
	Ref_LRR	$ 8.79	$ 4.39	$ 3.46	$ 4.92	$ 5.66	$ 6.46	$ 7.50	$ 8.57
	Ref_Hi-D	$ 8.79	$ 4.39	$ 3.33	$ 4.69	$ 5.43	$ 6.10	$ 6.97	$ 7.81
	LNG12_Ref	$ 8.79	$ 4.39	$ 3.31	$ 4.63	$ 5.35	$ 5.90	$ 6.94	$ 7.63
	LNG12_HRR	$ 8.79	$ 4.39	$ 3.19	$ 4.34	$ 4.83	$ 5.31	$ 6.06	$ 6.77
	LNG12_LRR	$ 8.79	$ 4.39	$ 3.45	$ 4.89	$ 5.74	$ 6.51	$ 7.54	$ 8.55
	LNG12_Hi-D	$ 8.79	$ 4.39	$ 3.33	$ 4.72	$ 5.45	$ 6.18	$ 7.11	$ 7.93
	LNG20_Ref	$ 8.79	$ 4.39	$ 3.32	$ 4.79	$ 5.44	$ 6.24	$ 7.41	$ 8.29
	LNG20_HRR	$ 8.79	$ 4.39	$ 3.22	$ 4.36	$ 4.95	$ 5.56	$ 6.47	$ 7.21
	LNG20_LRR	$ 8.79	$ 4.39	$ 3.47	$ 4.99	$ 5.81	$ 6.93	$ 8.30	$ 9.61
	LNG20_Hi-D	$ 8.79	$ 4.39	$ 3.35	$ 4.86	$ 5.53	$ 6.48	$ 7.69	$ 8.72
	LNG20_Ref12	$ 8.79	$ 4.39	$ 3.31	$ 4.75	$ 5.34	$ 6.13	$ 6.93	$ 7.69
	LNG20_HRR12	$ 8.79	$ 4.39	$ 3.20	$ 4.33	$ 4.91	$ 5.37	$ 5.86	$ 6.46
	LNG20_LRR12	$ 8.79	$ 4.39	$ 3.46	$ 4.98	$ 5.75	$ 6.89	$ 7.98	$ 9.27
	LNG20_Hi-D12	$ 8.79	$ 4.39	$ 3.34	$ 4.81	$ 5.48	$ 6.40	$ 7.31	$ 8.21
	LNG20_Ref20	$ 8.79	$ 4.39	$ 3.32	$ 4.76	$ 5.38	$ 6.23	$ 7.38	$ 8.18
	LNG20_HRR20	$ 8.79	$ 4.39	$ 3.22	$ 4.34	$ 4.92	$ 5.57	$ 6.23	$ 6.96
NBP	Ref_Ref	$ 7.38	$ 6.56	$ 7.43	$ 7.46	$ 8.36	$ 9.34	$ 10.18	$ 11.46
	Ref_HRR	$ 7.38	$ 6.56	$ 7.43	$ 7.45	$ 8.25	$ 9.43	$ 10.20	$ 11.54
	Ref_LRR	$ 7.38	$ 6.56	$ 7.43	$ 7.46	$ 8.34	$ 9.47	$ 10.28	$ 11.47
	Ref_Hi-D	$ 7.38	$ 6.56	$ 7.43	$ 7.48	$ 8.37	$ 9.42	$ 10.21	$ 11.55
	LNG12_Ref	$ 7.38	$ 6.56	$ 7.49	$ 7.70	$ 8.95	$ 10.80	$ 12.47	$ 14.27
	LNG12_HRR	$ 7.38	$ 6.56	$ 7.49	$ 7.73	$ 8.94	$ 10.80	$ 12.37	$ 14.17
	LNG12_LRR	$ 7.38	$ 6.56	$ 7.49	$ 7.73	$ 8.95	$ 10.76	$ 12.31	$ 13.95
	LNG12_Hi-D	$ 7.38	$ 6.56	$ 7.49	$ 7.73	$ 8.95	$ 10.79	$ 12.28	$ 14.02
	LNG20_Ref	$ 7.38	$ 6.56	$ 7.48	$ 7.75	$ 9.04	$ 10.84	$ 12.30	$ 14.32
	LNG20_HRR	$ 7.38	$ 6.56	$ 7.49	$ 7.75	$ 9.04	$ 10.81	$ 12.31	$ 14.13
	LNG20_LRR	$ 7.38	$ 6.56	$ 7.48	$ 7.77	$ 9.04	$ 10.88	$ 12.20	$ 14.35
	LNG20_Hi-D	$ 7.38	$ 6.56	$ 7.48	$ 7.74	$ 8.98	$ 10.80	$ 12.23	$ 14.14
	LNG20_Ref12	$ 7.38	$ 6.56	$ 7.49	$ 7.76	$ 8.96	$ 10.76	$ 12.23	$ 14.24
	LNG20_HRR12	$ 7.38	$ 6.56	$ 7.49	$ 7.76	$ 9.01	$ 10.84	$ 12.29	$ 14.21
	LNG20_LRR12	$ 7.38	$ 6.56	$ 7.48	$ 7.78	$ 8.99	$ 10.86	$ 12.19	$ 14.35
	LNG20_Hi-D12	$ 7.38	$ 6.56	$ 7.48	$ 7.74	$ 9.03	$ 10.86	$ 12.26	$ 14.27
	LNG20_Ref20	$ 7.38	$ 6.56	$ 7.48	$ 7.74	$ 9.01	$ 10.79	$ 12.28	$ 14.09
	LNG20_HRR20	$ 7.38	$ 6.56	$ 7.48	$ 7.76	$ 8.96	$ 10.86	$ 12.23	$ 14.26
JKM	Ref_Ref	$ 6.05	$ 10.91	$ 9.31	$ 8.95	$ 10.32	$ 11.12	$ 12.57	$ 13.58
	Ref_HRR	$ 6.05	$ 10.91	$ 9.50	$ 8.95	$ 10.15	$ 11.23	$ 12.68	$ 13.65
	Ref_LRR	$ 6.05	$ 10.91	$ 9.46	$ 8.98	$ 10.37	$ 11.38	$ 12.69	$ 13.63
	Ref_Hi-D	$ 6.05	$ 10.91	$ 9.47	$ 8.96	$ 10.37	$ 11.22	$ 12.71	$ 13.66
	LNG12_Ref	$ 6.05	$ 10.91	$ 9.51	$ 9.27	$ 11.62	$ 14.66	$ 16.04	$ 16.69
	LNG12_HRR	$ 6.05	$ 10.91	$ 9.54	$ 9.11	$ 11.59	$ 14.34	$ 15.55	$ 16.23
	LNG12_LRR	$ 6.05	$ 10.91	$ 9.50	$ 9.38	$ 11.66	$ 14.88	$ 16.74	$ 17.21
	LNG12_Hi-D	$ 6.05	$ 10.91	$ 9.62	$ 9.30	$ 11.66	$ 14.75	$ 16.41	$ 17.01
	LNG20_Ref	$ 6.05	$ 10.91	$ 9.55	$ 9.66	$ 13.64	$ 15.70	$ 17.29	$ 19.01
	LNG20_HRR	$ 6.05	$ 10.91	$ 9.67	$ 9.71	$ 13.49	$ 15.30	$ 16.51	$ 17.43
	LNG20_LRR	$ 6.05	$ 10.91	$ 9.66	$ 9.78	$ 13.74	$ 16.18	$ 18.18	$ 20.30
	LNG20_Hi-D	$ 6.05	$ 10.91	$ 9.65	$ 9.70	$ 13.68	$ 15.87	$ 17.54	$ 19.63
	LNG20_Ref12	$ 6.05	$ 10.91	$ 9.60	$ 9.72	$ 13.75	$ 16.03	$ 19.10	$ 22.80
	LNG20_HRR12	$ 6.05	$ 10.91	$ 9.64	$ 9.74	$ 13.61	$ 16.03	$ 19.13	$ 22.83
	LNG20_LRR12	$ 6.05	$ 10.91	$ 9.46	$ 9.84	$ 13.84	$ 16.34	$ 19.05	$ 22.76
	LNG20_Hi-D12	$ 6.05	$ 10.91	$ 9.53	$ 9.70	$ 13.78	$ 16.16	$ 19.06	$ 22.76
	LNG20_Ref20	$ 6.05	$ 10.91	$ 9.59	$ 9.68	$ 13.64	$ 15.78	$ 17.44	$ 20.01
	LNG20_HRR20	$ 6.05	$ 10.91	$ 9.70	$ 9.71	$ 13.48	$ 15.41	$ 17.23	$ 19.81

[44] RWGTM outputs are annual and more detailed than indicated. The tables simply reveal trends across scenarios.
[45] Only international benchmark prices are presented here to highlight general scenario outcomes.

D2. Demand (tcf)[46]

Ref_Ref Case (Demand)(tcf)

	2005	2010	2015	2020	2025	2030	2035	2040	cagr 2005-15	cagr 2015-25	cagr 2025-40
North America	**26.814**	**29.188**	**32.750**	**34.643**	**36.561**	**37.177**	**37.924**	**38.871**	**2.02%**	**1.11%**	**0.41%**
Canada	3.144	2.815	3.134	3.372	3.504	3.569	3.632	3.712	-0.03%	1.12%	0.38%
Mexico	1.656	2.286	2.486	2.646	2.854	3.078	3.295	3.489	4.14%	1.39%	1.35%
United States	22.014	24.087	27.130	28.624	30.204	30.530	30.997	31.670	2.11%	1.08%	0.32%
Central & South America	**4.208**	**4.897**	**5.729**	**6.175**	**6.881**	**7.457**	**7.902**	**8.256**	**3.13%**	**1.85%**	**1.22%**
Argentina	1.428	1.529	1.612	1.864	2.036	2.174	2.288	2.386	1.22%	2.37%	1.06%
Brazil	0.657	0.890	1.157	1.350	1.557	1.744	1.888	2.000	5.82%	3.02%	1.68%
Chile	0.295	0.187	0.231	0.290	0.333	0.370	0.402	0.426	-2.40%	3.72%	1.65%
Colombia	0.236	0.321	0.393	0.402	0.446	0.491	0.524	0.562	5.25%	1.27%	1.56%
Peru	0.056	0.194	0.220	0.234	0.265	0.290	0.314	0.328	14.69%	1.91%	1.43%
Trinidad and Tobago	0.575	0.824	0.752	0.760	0.770	0.757	0.742	0.716	2.73%	0.24%	-0.48%
Venezuela	0.828	0.748	1.102	0.980	1.131	1.237	1.301	1.340	2.90%	0.27%	1.13%
Other Central & South America	0.135	0.205	0.264	0.294	0.343	0.394	0.443	0.498	6.96%	2.66%	2.53%
Europe	**20.095**	**20.525**	**17.991**	**18.715**	**19.325**	**19.582**	**19.658**	**19.524**	**-1.10%**	**0.72%**	**0.07%**
Austria	0.354	0.353	0.286	0.295	0.307	0.314	0.318	0.318	-2.10%	0.71%	0.24%
Belgium	0.601	0.700	0.613	0.655	0.696	0.729	0.742	0.746	0.19%	1.29%	0.46%
France	1.740	1.695	1.425	1.440	1.438	1.391	1.349	1.297	-1.98%	0.09%	-0.69%
Germany	3.203	3.329	3.061	3.116	3.176	3.191	3.137	3.048	-0.45%	0.37%	-0.27%
Italy	3.046	2.935	2.324	2.343	2.358	2.359	2.352	2.329	-2.67%	0.15%	-0.08%
Netherlands	1.741	1.937	1.720	1.755	1.759	1.726	1.681	1.616	-0.12%	0.23%	-0.56%
Norway	0.187	0.194	0.223	0.239	0.257	0.238	0.204	0.195	1.77%	1.41%	-1.81%
Poland	0.573	0.606	0.617	0.689	0.759	0.823	0.866	0.900	0.75%	2.09%	1.14%
Portugal	0.152	0.182	0.146	0.153	0.160	0.165	0.169	0.168	-0.43%	0.95%	0.34%
Romania	0.643	0.455	0.454	0.493	0.521	0.529	0.533	0.523	-3.42%	1.39%	0.03%
Spain	1.188	1.265	1.052	1.100	1.144	1.177	1.193	1.206	-1.21%	0.84%	0.36%
Turkey	0.967	1.346	1.533	1.684	1.801	1.879	1.970	2.057	4.72%	1.62%	0.89%
United Kingdom	3.376	3.337	2.648	2.727	2.802	2.847	2.913	2.904	-2.40%	0.57%	0.24%
Other Europe	2.324	2.192	1.890	2.027	2.148	2.213	2.231	2.216	-2.04%	1.29%	0.21%
Eurasia	**21.786**	**21.616**	**21.674**	**22.964**	**24.213**	**24.911**	**25.213**	**25.528**	**-0.05%**	**1.11%**	**0.35%**
Kazakhstan	0.477	0.303	0.474	0.557	0.636	0.692	0.728	0.764	-0.05%	2.97%	1.23%
Russia	14.330	15.471	15.274	15.707	16.173	16.293	16.207	16.095	0.64%	0.57%	-0.03%
Turkmenistan	0.629	0.720	0.765	0.928	1.088	1.217	1.336	1.439	1.98%	3.59%	1.88%
Ukraine	3.079	1.969	1.678	1.771	1.845	1.886	1.895	1.878	-5.89%	0.95%	0.12%
Uzbekistan	1.702	1.614	1.890	2.278	2.621	2.893	3.098	3.404	1.05%	3.33%	1.76%
Other Eurasia	1.569	1.538	1.593	1.723	1.850	1.929	1.948	1.950	0.15%	1.51%	0.35%
Middle East	**9.825**	**13.379**	**14.479**	**15.521**	**17.077**	**18.325**	**19.508**	**20.584**	**3.95%**	**1.66%**	**1.25%**
Iran	3.707	5.106	5.243	5.488	5.929	6.295	6.612	6.936	3.53%	1.24%	1.05%
Qatar	0.660	0.796	1.103	1.142	1.219	1.277	1.313	1.332	5.26%	1.01%	0.59%
Oman	0.324	0.620	0.710	0.780	0.859	0.908	0.939	0.978	8.17%	1.92%	0.87%
Saudi Arabia	2.516	3.096	3.511	3.893	4.422	4.842	5.193	5.471	3.39%	2.33%	1.43%
United Arab Emirates	1.457	2.147	2.202	2.295	2.463	2.547	2.707	2.836	4.22%	1.13%	0.94%
Other Middle East	1.160	1.614	1.711	1.922	2.185	2.456	2.744	3.032	3.96%	2.48%	2.21%
Africa	**2.979**	**3.535**	**3.893**	**4.597**	**5.542**	**6.591**	**7.721**	**8.867**	**2.71%**	**3.59%**	**3.18%**
Algeria	0.846	1.024	1.086	1.225	1.419	1.591	1.709	1.792	2.53%	2.71%	1.57%
Egypt	1.208	1.630	1.795	2.035	2.360	2.745	3.285	3.859	4.04%	2.77%	3.33%
Nigeria	0.366	0.178	0.257	0.363	0.525	0.716	0.904	1.109	-3.45%	7.39%	5.11%
Other Africa	0.559	0.702	0.755	0.974	1.238	1.538	1.823	2.107	3.06%	5.08%	3.61%
Asia & Oceania	**13.741**	**20.677**	**23.990**	**29.993**	**35.490**	**40.679**	**45.807**	**50.141**	**5.73%**	**3.99%**	**2.33%**
Australia	1.014	1.249	1.543	1.786	1.919	2.002	2.070	2.115	4.29%	2.20%	0.65%
China	1.655	3.769	6.044	8.654	11.656	14.610	17.543	20.394	13.83%	6.79%	3.80%
India	1.269	2.277	1.969	2.800	3.410	4.151	4.949	5.656	4.49%	5.65%	3.43%
Indonesia	0.638	1.397	1.380	1.653	1.987	2.377	2.730	3.051	8.01%	3.71%	2.90%
Japan	3.110	3.861	4.011	4.054	3.996	3.887	3.934	3.891	2.58%	-0.04%	-0.18%
Malaysia	0.914	1.145	1.084	1.289	1.420	1.496	1.531	1.533	1.72%	2.74%	0.51%
Myanmar	0.146	0.114	0.119	0.165	0.216	0.266	0.332	0.399	-2.04%	6.14%	4.17%
Pakistan	1.088	1.400	1.333	1.679	2.023	2.354	2.592	2.632	2.05%	4.26%	1.77%
Singapore	0.233	0.297	0.370	0.409	0.417	0.416	0.409	0.393	4.72%	1.21%	-0.40%
South Korea	1.076	1.524	1.975	2.407	2.636	2.779	2.813	2.765	6.26%	2.93%	0.32%
Thailand	1.150	1.592	1.839	2.133	2.306	2.387	2.512	2.581	4.81%	2.29%	0.75%
Other Asia & Oceania	1.447	2.051	2.324	2.966	3.504	3.953	4.393	4.729	4.85%	4.19%	2.02%
World	**99.448**	**113.816**	**120.506**	**132.609**	**145.089**	**154.722**	**163.732**	**171.770**	**1.94%**	**1.87%**	**1.13%**

[46] Demand includes Lease and Plant Use and Pipeline Fuel. Historical data match those reported by EIA.

Ref_HRR Case (Demand)(tcf)

	2005	2010	2015	2020	2025	2030	2035	2040	cagr 2005-15	cagr 2015-25	cagr 2025-40
North America	**26.814**	**29.188**	**32.881**	**35.118**	**37.060**	**37.972**	**38.922**	**40.021**	**2.06%**	**1.20%**	**0.51%**
Canada	3.144	2.815	3.125	3.322	3.480	3.591	3.669	3.762	-0.06%	1.08%	0.52%
Mexico	1.656	2.286	2.499	2.652	2.851	3.042	3.244	3.433	4.20%	1.33%	1.24%
United States	22.014	24.087	27.258	29.144	30.729	31.339	32.009	32.827	2.16%	1.21%	0.44%
Central & South America	**4.208**	**4.897**	**5.729**	**6.176**	**6.883**	**7.464**	**7.889**	**8.286**	**3.13%**	**1.85%**	**1.24%**
Argentina	1.428	1.529	1.611	1.863	2.035	2.175	2.286	2.391	1.21%	2.36%	1.08%
Brazil	0.657	0.890	1.156	1.350	1.556	1.744	1.887	2.005	5.81%	3.01%	1.70%
Chile	0.295	0.187	0.231	0.290	0.333	0.370	0.402	0.426	-2.39%	3.72%	1.65%
Colombia	0.236	0.321	0.393	0.402	0.445	0.493	0.521	0.562	5.25%	1.26%	1.57%
Peru	0.056	0.194	0.221	0.234	0.265	0.290	0.313	0.331	14.73%	1.85%	1.50%
Trinidad and Tobago	0.575	0.824	0.752	0.760	0.772	0.759	0.741	0.716	2.72%	0.27%	-0.50%
Venezuela	0.828	0.748	1.102	0.981	1.133	1.238	1.295	1.358	2.90%	0.28%	1.22%
Other Central & South America	0.135	0.205	0.263	0.295	0.343	0.394	0.444	0.496	6.94%	2.68%	2.50%
Europe	**20.095**	**20.525**	**17.989**	**18.726**	**19.360**	**19.551**	**19.642**	**19.481**	**-1.10%**	**0.74%**	**0.04%**
Austria	0.354	0.353	0.286	0.296	0.308	0.314	0.318	0.317	-2.11%	0.74%	0.21%
Belgium	0.601	0.700	0.613	0.655	0.697	0.728	0.741	0.745	0.19%	1.30%	0.44%
France	1.740	1.695	1.425	1.443	1.446	1.387	1.346	1.293	-1.98%	0.15%	-0.74%
Germany	3.203	3.329	3.060	3.117	3.182	3.185	3.134	3.039	-0.45%	0.39%	-0.31%
Italy	3.046	2.935	2.323	2.344	2.360	2.357	2.351	2.327	-2.67%	0.16%	-0.09%
Netherlands	1.741	1.937	1.720	1.755	1.761	1.724	1.681	1.616	-0.12%	0.23%	-0.57%
Norway	0.187	0.194	0.223	0.237	0.255	0.238	0.206	0.195	1.77%	1.35%	-1.76%
Poland	0.573	0.606	0.618	0.689	0.761	0.817	0.860	0.885	0.75%	2.11%	1.01%
Portugal	0.152	0.182	0.146	0.153	0.160	0.165	0.168	0.168	-0.42%	0.98%	0.32%
Romania	0.643	0.455	0.454	0.493	0.521	0.528	0.533	0.522	-3.42%	1.40%	0.01%
Spain	1.188	1.265	1.052	1.102	1.147	1.176	1.192	1.206	-1.21%	0.87%	0.34%
Turkey	0.967	1.346	1.533	1.686	1.804	1.878	1.970	2.053	4.72%	1.64%	0.86%
United Kingdom	3.376	3.337	2.648	2.728	2.803	2.844	2.913	2.904	-2.40%	0.57%	0.23%
Other Europe	2.324	2.192	1.889	2.028	2.154	2.209	2.230	2.210	-2.05%	1.32%	0.17%
Eurasia	**21.786**	**21.616**	**21.674**	**22.974**	**24.234**	**24.909**	**25.207**	**25.482**	**-0.05%**	**1.12%**	**0.34%**
Kazakhstan	0.477	0.303	0.474	0.557	0.636	0.692	0.729	0.760	-0.05%	2.98%	1.19%
Russia	14.330	15.471	15.275	15.713	16.184	16.291	16.203	16.060	0.64%	0.58%	-0.05%
Turkmenistan	0.629	0.720	0.765	0.928	1.090	1.220	1.337	1.437	1.98%	3.61%	1.86%
Ukraine	3.079	1.969	1.677	1.772	1.847	1.884	1.894	1.875	-5.89%	0.97%	0.10%
Uzbekistan	1.702	1.614	1.890	2.280	2.625	2.893	3.096	3.401	1.05%	3.34%	1.74%
Other Eurasia	1.569	1.538	1.593	1.724	1.852	1.929	1.949	1.949	0.15%	1.52%	0.34%
Middle East	**9.825**	**13.379**	**14.479**	**15.524**	**17.088**	**18.338**	**19.509**	**20.573**	**3.95%**	**1.67%**	**1.25%**
Iran	3.707	5.106	5.243	5.490	5.935	6.301	6.603	6.923	3.53%	1.25%	1.03%
Qatar	0.660	0.796	1.102	1.142	1.219	1.279	1.312	1.332	5.26%	1.01%	0.59%
Oman	0.324	0.620	0.710	0.780	0.859	0.908	0.939	0.977	8.17%	1.92%	0.86%
Saudi Arabia	2.516	3.096	3.510	3.894	4.425	4.842	5.206	5.490	3.39%	2.34%	1.45%
United Arab Emirates	1.457	2.147	2.203	2.296	2.464	2.556	2.708	2.839	4.22%	1.13%	0.95%
Other Middle East	1.160	1.614	1.711	1.922	2.186	2.453	2.741	3.011	3.96%	2.48%	2.16%
Africa	**2.979**	**3.535**	**3.894**	**4.597**	**5.539**	**6.596**	**7.726**	**8.872**	**2.71%**	**3.59%**	**3.19%**
Algeria	0.846	1.024	1.086	1.225	1.420	1.589	1.707	1.793	2.53%	2.72%	1.57%
Egypt	1.208	1.630	1.795	2.034	2.353	2.746	3.287	3.855	4.04%	2.74%	3.35%
Nigeria	0.366	0.178	0.258	0.363	0.526	0.721	0.904	1.107	-3.45%	7.41%	5.08%
Other Africa	0.559	0.702	0.755	0.975	1.240	1.539	1.828	2.116	3.06%	5.09%	3.63%
Asia & Oceania	**13.741**	**20.677**	**23.987**	**29.988**	**35.545**	**40.608**	**45.768**	**50.056**	**5.73%**	**4.01%**	**2.31%**
Australia	1.014	1.249	1.544	1.781	1.919	1.998	2.068	2.108	4.29%	2.20%	0.63%
China	1.655	3.769	6.043	8.652	11.668	14.567	17.522	20.361	13.83%	6.80%	3.78%
India	1.269	2.277	1.968	2.800	3.419	4.148	4.941	5.648	4.49%	5.68%	3.40%
Indonesia	0.638	1.397	1.380	1.652	1.985	2.376	2.729	3.048	8.01%	3.70%	2.90%
Japan	3.110	3.861	4.011	4.054	4.010	3.882	3.931	3.888	2.58%	0.00%	-0.21%
Malaysia	0.914	1.145	1.083	1.287	1.420	1.493	1.534	1.531	1.72%	2.74%	0.50%
Myanmar	0.146	0.114	0.119	0.165	0.216	0.266	0.332	0.397	-2.04%	6.14%	4.15%
Pakistan	1.088	1.400	1.333	1.679	2.034	2.349	2.588	2.644	2.05%	4.32%	1.76%
Singapore	0.233	0.297	0.370	0.409	0.418	0.416	0.409	0.393	4.72%	1.21%	-0.41%
South Korea	1.076	1.524	1.975	2.407	2.644	2.776	2.809	2.760	6.26%	2.96%	0.28%
Thailand	1.150	1.592	1.838	2.133	2.307	2.387	2.512	2.574	4.80%	2.30%	0.73%
Other Asia & Oceania	1.447	2.051	2.323	2.970	3.505	3.949	4.393	4.705	4.85%	4.20%	1.98%
World	**99.448**	**113.816**	**120.633**	**133.104**	**145.710**	**155.438**	**164.664**	**172.771**	**1.95%**	**1.91%**	**1.14%**

Ref_LRR Case (Demand)(tcf)

	2005	2010	2015	2020	2025	2030	2035	2040	cagr 2005-15	cagr 2015-25	cagr 2025-40
North America	**26.814**	**29.188**	**32.506**	**34.361**	**36.156**	**36.532**	**37.288**	**38.114**	**1.94%**	**1.07%**	**0.35%**
Canada	3.144	2.815	3.134	3.390	3.496	3.551	3.611	3.692	-0.03%	1.10%	0.36%
Mexico	1.656	2.286	2.476	2.631	2.874	3.103	3.344	3.521	4.10%	1.50%	1.36%
United States	22.014	24.087	26.896	28.340	29.786	29.878	30.332	30.902	2.02%	1.03%	0.25%
Central & South America	**4.208**	**4.897**	**5.730**	**6.170**	**6.883**	**7.456**	**7.890**	**8.264**	**3.13%**	**1.85%**	**1.23%**
Argentina	1.428	1.529	1.612	1.863	2.035	2.175	2.287	2.388	1.22%	2.36%	1.07%
Brazil	0.657	0.890	1.157	1.349	1.556	1.744	1.887	2.002	5.82%	3.01%	1.69%
Chile	0.295	0.187	0.231	0.290	0.333	0.370	0.402	0.425	-2.40%	3.72%	1.65%
Colombia	0.236	0.321	0.393	0.403	0.446	0.491	0.521	0.561	5.25%	1.27%	1.55%
Peru	0.056	0.194	0.220	0.234	0.265	0.289	0.313	0.333	14.68%	1.88%	1.54%
Trinidad and Tobago	0.575	0.824	0.753	0.757	0.772	0.758	0.741	0.714	2.74%	0.25%	-0.52%
Venezuela	0.828	0.748	1.102	0.978	1.134	1.235	1.296	1.345	2.90%	0.29%	1.15%
Other Central & South America	0.135	0.205	0.263	0.296	0.342	0.393	0.445	0.495	6.93%	2.66%	2.50%
Europe	**20.095**	**20.525**	**17.992**	**18.714**	**19.328**	**19.529**	**19.623**	**19.518**	**-1.10%**	**0.72%**	**0.07%**
Austria	0.354	0.353	0.286	0.295	0.307	0.313	0.318	0.318	-2.10%	0.72%	0.23%
Belgium	0.601	0.700	0.613	0.655	0.696	0.727	0.741	0.746	0.19%	1.29%	0.46%
France	1.740	1.695	1.425	1.437	1.436	1.381	1.344	1.296	-1.98%	0.07%	-0.68%
Germany	3.203	3.329	3.061	3.115	3.176	3.182	3.131	3.047	-0.45%	0.37%	-0.28%
Italy	3.046	2.935	2.324	2.342	2.358	2.355	2.349	2.329	-2.67%	0.15%	-0.08%
Netherlands	1.741	1.937	1.720	1.756	1.760	1.724	1.679	1.616	-0.12%	0.23%	-0.57%
Norway	0.187	0.194	0.223	0.240	0.257	0.238	0.204	0.196	1.78%	1.42%	-1.79%
Poland	0.573	0.606	0.618	0.689	0.760	0.819	0.862	0.899	0.76%	2.09%	1.13%
Portugal	0.152	0.182	0.145	0.153	0.160	0.164	0.168	0.168	-0.43%	0.94%	0.35%
Romania	0.643	0.455	0.454	0.493	0.521	0.528	0.533	0.523	-3.42%	1.39%	0.03%
Spain	1.188	1.265	1.052	1.099	1.142	1.172	1.191	1.206	-1.21%	0.83%	0.36%
Turkey	0.967	1.346	1.533	1.687	1.802	1.874	1.968	2.055	4.72%	1.63%	0.88%
United Kingdom	3.376	3.337	2.647	2.728	2.804	2.845	2.909	2.904	-2.40%	0.58%	0.23%
Other Europe	2.324	2.192	1.890	2.026	2.149	2.205	2.226	2.215	-2.05%	1.29%	0.20%
Eurasia	**21.786**	**21.616**	**21.674**	**22.970**	**24.225**	**24.886**	**25.212**	**25.504**	**-0.05%**	**1.12%**	**0.34%**
Kazakhstan	0.477	0.303	0.474	0.557	0.637	0.691	0.731	0.764	-0.05%	2.99%	1.23%
Russia	14.330	15.471	15.274	15.710	16.178	16.277	16.208	16.074	0.64%	0.58%	-0.04%
Turkmenistan	0.629	0.720	0.765	0.929	1.088	1.215	1.335	1.435	1.98%	3.59%	1.86%
Ukraine	3.079	1.969	1.678	1.771	1.847	1.885	1.894	1.879	-5.89%	0.97%	0.12%
Uzbekistan	1.702	1.614	1.890	2.279	2.623	2.890	3.096	3.402	1.05%	3.33%	1.75%
Other Eurasia	1.569	1.538	1.593	1.724	1.852	1.928	1.948	1.949	0.15%	1.52%	0.34%
Middle East	**9.825**	**13.379**	**14.479**	**15.527**	**17.080**	**18.351**	**19.527**	**20.597**	**3.95%**	**1.67%**	**1.26%**
Iran	3.707	5.106	5.243	5.495	5.931	6.308	6.625	6.922	3.53%	1.24%	1.04%
Qatar	0.660	0.796	1.102	1.142	1.219	1.277	1.312	1.345	5.26%	1.01%	0.66%
Oman	0.324	0.620	0.710	0.780	0.859	0.909	0.943	0.973	8.17%	1.92%	0.84%
Saudi Arabia	2.516	3.096	3.510	3.892	4.422	4.848	5.202	5.488	3.39%	2.34%	1.45%
United Arab Emirates	1.457	2.147	2.203	2.296	2.464	2.554	2.703	2.845	4.22%	1.13%	0.96%
Other Middle East	1.160	1.614	1.710	1.921	2.186	2.455	2.743	3.023	3.95%	2.48%	2.19%
Africa	**2.979**	**3.535**	**3.894**	**4.598**	**5.550**	**6.588**	**7.716**	**8.877**	**2.72%**	**3.61%**	**3.18%**
Algeria	0.846	1.024	1.086	1.225	1.420	1.590	1.704	1.789	2.53%	2.71%	1.56%
Egypt	1.208	1.630	1.795	2.035	2.362	2.742	3.280	3.859	4.04%	2.78%	3.33%
Nigeria	0.366	0.178	0.258	0.362	0.530	0.720	0.911	1.110	-3.42%	7.44%	5.06%
Other Africa	0.559	0.702	0.755	0.975	1.239	1.536	1.821	2.118	3.06%	5.08%	3.64%
Asia & Oceania	**13.741**	**20.677**	**23.989**	**29.985**	**35.478**	**40.573**	**45.778**	**50.001**	**5.73%**	**3.99%**	**2.31%**
Australia	1.014	1.249	1.544	1.788	1.920	2.000	2.068	2.109	4.29%	2.20%	0.63%
China	1.655	3.769	6.044	8.647	11.663	14.561	17.548	20.335	13.83%	6.79%	3.78%
India	1.269	2.277	1.969	2.798	3.410	4.142	4.935	5.637	4.49%	5.65%	3.41%
Indonesia	0.638	1.397	1.380	1.654	1.987	2.379	2.731	3.052	8.01%	3.71%	2.90%
Japan	3.110	3.861	4.011	4.052	3.992	3.874	3.929	3.890	2.58%	-0.05%	-0.17%
Malaysia	0.914	1.145	1.084	1.287	1.420	1.495	1.529	1.531	1.72%	2.74%	0.50%
Myanmar	0.146	0.114	0.119	0.165	0.215	0.265	0.332	0.397	-2.05%	6.12%	4.18%
Pakistan	1.088	1.400	1.333	1.679	2.021	2.342	2.585	2.625	2.05%	4.25%	1.76%
Singapore	0.233	0.297	0.370	0.409	0.417	0.416	0.408	0.393	4.72%	1.20%	-0.40%
South Korea	1.076	1.524	1.975	2.405	2.633	2.769	2.804	2.757	6.26%	2.92%	0.31%
Thailand	1.150	1.592	1.838	2.132	2.302	2.385	2.512	2.577	4.80%	2.27%	0.76%
Other Asia & Oceania	1.447	2.051	2.322	2.969	3.499	3.946	4.396	4.697	4.84%	4.19%	1.98%
World	**99.448**	**113.816**	**120.263**	**132.325**	**144.700**	**153.914**	**163.034**	**170.875**	**1.92%**	**1.87%**	**1.11%**

Ref_Hi-D Case (Demand)(tcf)

	2005	2010	2015	2020	2025	2030	2035	2040	cagr 2005-15	cagr 2015-25	cagr 2025-40
North America	**26.814**	**29.188**	**32.838**	**35.538**	**38.173**	**39.441**	**40.216**	**41.102**	**2.05%**	**1.52%**	**0.49%**
Canada	3.144	2.815	3.132	3.381	3.502	3.561	3.622	3.703	-0.04%	1.12%	0.37%
Mexico	1.656	2.286	2.485	2.640	2.859	3.091	3.303	3.508	4.14%	1.41%	1.37%
United States	22.014	24.087	27.221	29.517	31.812	32.789	33.291	33.891	2.15%	1.57%	0.42%
Central & South America	**4.208**	**4.897**	**5.729**	**6.173**	**6.885**	**7.461**	**7.894**	**8.252**	**3.13%**	**1.86%**	**1.22%**
Argentina	1.428	1.529	1.611	1.863	2.036	2.176	2.286	2.391	1.22%	2.37%	1.08%
Brazil	0.657	0.890	1.157	1.349	1.557	1.745	1.887	2.004	5.82%	3.02%	1.70%
Chile	0.295	0.187	0.231	0.290	0.333	0.370	0.401	0.426	-2.40%	3.73%	1.66%
Colombia	0.236	0.321	0.393	0.402	0.446	0.491	0.524	0.561	5.25%	1.28%	1.54%
Peru	0.056	0.194	0.219	0.233	0.266	0.291	0.313	0.331	14.66%	1.96%	1.47%
Trinidad and Tobago	0.575	0.824	0.752	0.760	0.770	0.757	0.740	0.712	2.73%	0.24%	-0.52%
Venezuela	0.828	0.748	1.102	0.981	1.134	1.234	1.300	1.340	2.90%	0.29%	1.12%
Other Central & South America	0.135	0.205	0.263	0.294	0.342	0.397	0.442	0.487	6.95%	2.66%	2.37%
Europe	**20.095**	**20.525**	**17.991**	**18.709**	**19.319**	**19.557**	**19.647**	**19.483**	**-1.10%**	**0.71%**	**0.06%**
Austria	0.354	0.353	0.286	0.295	0.307	0.314	0.318	0.317	-2.10%	0.71%	0.23%
Belgium	0.601	0.700	0.613	0.655	0.696	0.728	0.741	0.745	0.19%	1.28%	0.45%
France	1.740	1.695	1.425	1.438	1.436	1.388	1.346	1.293	-1.98%	0.07%	-0.70%
Germany	3.203	3.329	3.061	3.114	3.174	3.186	3.135	3.041	-0.45%	0.36%	-0.29%
Italy	3.046	2.935	2.324	2.342	2.357	2.357	2.351	2.327	-2.67%	0.14%	-0.09%
Netherlands	1.741	1.937	1.720	1.755	1.760	1.724	1.681	1.615	-0.12%	0.23%	-0.57%
Norway	0.187	0.194	0.223	0.239	0.257	0.238	0.205	0.194	1.77%	1.43%	-1.86%
Poland	0.573	0.606	0.618	0.688	0.760	0.822	0.865	0.897	0.75%	2.09%	1.11%
Portugal	0.152	0.182	0.145	0.153	0.160	0.165	0.168	0.168	-0.43%	0.95%	0.34%
Romania	0.643	0.455	0.454	0.493	0.521	0.529	0.533	0.522	-3.42%	1.39%	0.02%
Spain	1.188	1.265	1.052	1.100	1.143	1.176	1.192	1.205	-1.21%	0.83%	0.35%
Turkey	0.967	1.346	1.533	1.686	1.799	1.878	1.968	2.052	4.72%	1.61%	0.88%
United Kingdom	3.376	3.337	2.648	2.726	2.802	2.844	2.913	2.898	-2.40%	0.57%	0.22%
Other Europe	2.324	2.192	1.890	2.026	2.147	2.209	2.229	2.209	-2.05%	1.29%	0.19%
Eurasia	**21.786**	**21.616**	**21.674**	**22.968**	**24.209**	**24.897**	**25.194**	**25.479**	**-0.05%**	**1.11%**	**0.34%**
Kazakhstan	0.477	0.303	0.474	0.557	0.635	0.691	0.730	0.763	-0.05%	2.95%	1.23%
Russia	14.330	15.471	15.274	15.708	16.167	16.282	16.192	16.055	0.64%	0.57%	-0.05%
Turkmenistan	0.629	0.720	0.765	0.929	1.090	1.218	1.335	1.436	1.98%	3.60%	1.86%
Ukraine	3.079	1.969	1.678	1.771	1.845	1.885	1.894	1.875	-5.89%	0.96%	0.11%
Uzbekistan	1.702	1.614	1.890	2.280	2.622	2.892	3.096	3.401	1.05%	3.33%	1.75%
Other Eurasia	1.569	1.538	1.593	1.723	1.851	1.930	1.948	1.949	0.15%	1.51%	0.35%
Middle East	**9.825**	**13.379**	**14.477**	**15.518**	**17.082**	**18.346**	**19.509**	**20.598**	**3.95%**	**1.67%**	**1.26%**
Iran	3.707	5.106	5.243	5.487	5.932	6.301	6.617	6.925	3.53%	1.24%	1.04%
Qatar	0.660	0.796	1.102	1.142	1.219	1.279	1.312	1.328	5.26%	1.01%	0.57%
Oman	0.324	0.620	0.710	0.780	0.859	0.909	0.940	0.982	8.17%	1.92%	0.90%
Saudi Arabia	2.516	3.096	3.511	3.892	4.422	4.853	5.204	5.487	3.39%	2.34%	1.45%
United Arab Emirates	1.457	2.147	2.202	2.296	2.465	2.549	2.700	2.858	4.22%	1.13%	0.99%
Other Middle East	1.160	1.614	1.708	1.921	2.184	2.456	2.736	3.018	3.94%	2.49%	2.18%
Africa	**2.979**	**3.535**	**3.895**	**4.597**	**5.541**	**6.595**	**7.721**	**8.877**	**2.72%**	**3.59%**	**3.19%**
Algeria	0.846	1.024	1.086	1.226	1.421	1.591	1.709	1.790	2.53%	2.73%	1.55%
Egypt	1.208	1.630	1.795	2.034	2.355	2.745	3.285	3.854	4.04%	2.75%	3.34%
Nigeria	0.366	0.178	0.259	0.363	0.527	0.721	0.904	1.123	-3.41%	7.37%	5.17%
Other Africa	0.559	0.702	0.755	0.975	1.239	1.538	1.822	2.110	3.06%	5.08%	3.62%
Asia & Oceania	**13.741**	**20.677**	**23.991**	**29.992**	**35.464**	**40.610**	**45.733**	**50.039**	**5.73%**	**3.99%**	**2.32%**
Australia	1.014	1.249	1.544	1.785	1.921	1.999	2.065	2.107	4.29%	2.21%	0.62%
China	1.655	3.769	6.045	8.653	11.652	14.571	17.506	20.350	13.83%	6.78%	3.79%
India	1.269	2.277	1.969	2.798	3.403	4.144	4.939	5.645	4.49%	5.63%	3.43%
Indonesia	0.638	1.397	1.380	1.654	1.987	2.375	2.726	3.043	8.01%	3.71%	2.88%
Japan	3.110	3.861	4.011	4.053	3.992	3.883	3.930	3.887	2.58%	-0.05%	-0.18%
Malaysia	0.914	1.145	1.084	1.288	1.420	1.494	1.531	1.529	1.72%	2.74%	0.50%
Myanmar	0.146	0.114	0.119	0.165	0.216	0.266	0.332	0.398	-2.05%	6.13%	4.18%
Pakistan	1.088	1.400	1.333	1.679	2.019	2.352	2.587	2.643	2.05%	4.24%	1.81%
Singapore	0.233	0.297	0.370	0.409	0.417	0.416	0.408	0.393	4.72%	1.21%	-0.40%
South Korea	1.076	1.524	1.975	2.406	2.633	2.776	2.808	2.759	6.26%	2.92%	0.31%
Thailand	1.150	1.592	1.838	2.133	2.304	2.385	2.510	2.574	4.80%	2.28%	0.74%
Other Asia & Oceania	1.447	2.051	2.324	2.970	3.501	3.948	4.389	4.711	4.85%	4.18%	2.00%
World	**99.448**	**113.816**	**120.594**	**133.495**	**146.674**	**156.909**	**165.914**	**173.831**	**1.95%**	**1.98%**	**1.14%**

LNG12_Ref Case (Demand)(tcf)

	2005	2010	2015	2020	2025	2030	2035	2040	cagr 2005-15	cagr 2015-25	cagr 2025-40
North America	**26.814**	**29.188**	**32.721**	**34.763**	**36.660**	**37.292**	**38.113**	**39.078**	**2.01%**	**1.14%**	**0.43%**
Canada	3.144	2.815	3.128	3.364	3.511	3.585	3.667	3.722	-0.05%	1.16%	0.39%
Mexico	1.656	2.286	2.487	2.644	2.849	3.074	3.294	3.509	4.15%	1.37%	1.40%
United States	22.014	24.087	27.106	28.755	30.301	30.634	31.151	31.846	2.10%	1.12%	0.33%
Central & South America	**4.208**	**4.897**	**5.725**	**6.170**	**6.888**	**7.455**	**7.876**	**8.173**	**3.13%**	**1.87%**	**1.15%**
Argentina	1.428	1.529	1.612	1.862	2.037	2.175	2.289	2.384	1.22%	2.37%	1.06%
Brazil	0.657	0.890	1.157	1.348	1.556	1.746	1.886	2.004	5.82%	3.01%	1.70%
Chile	0.295	0.187	0.231	0.290	0.333	0.370	0.402	0.426	-2.40%	3.72%	1.65%
Colombia	0.236	0.321	0.393	0.402	0.446	0.490	0.522	0.559	5.25%	1.27%	1.52%
Peru	0.056	0.194	0.218	0.234	0.265	0.291	0.312	0.331	14.61%	1.95%	1.50%
Trinidad and Tobago	0.575	0.824	0.750	0.761	0.775	0.761	0.738	0.706	2.70%	0.33%	-0.62%
Venezuela	0.828	0.748	1.102	0.981	1.135	1.234	1.306	1.334	2.90%	0.30%	1.08%
Other Central & South America	0.135	0.205	0.263	0.292	0.341	0.388	0.423	0.429	6.93%	2.66%	1.54%
Europe	**20.095**	**20.525**	**17.967**	**18.614**	**19.115**	**19.234**	**19.244**	**19.026**	**-1.11%**	**0.62%**	**-0.03%**
Austria	0.354	0.353	0.286	0.294	0.305	0.311	0.314	0.314	-2.11%	0.66%	0.19%
Belgium	0.601	0.700	0.612	0.651	0.689	0.717	0.728	0.730	0.18%	1.20%	0.38%
France	1.740	1.695	1.421	1.419	1.396	1.329	1.288	1.243	-2.01%	-0.17%	-0.77%
Germany	3.203	3.329	3.057	3.095	3.139	3.147	3.078	2.976	-0.47%	0.27%	-0.35%
Italy	3.046	2.935	2.322	2.337	2.349	2.344	2.339	2.317	-2.68%	0.12%	-0.09%
Netherlands	1.741	1.937	1.717	1.739	1.733	1.683	1.635	1.578	-0.14%	0.09%	-0.62%
Norway	0.187	0.194	0.225	0.247	0.263	0.256	0.239	0.225	1.86%	1.58%	-1.03%
Poland	0.573	0.606	0.618	0.681	0.735	0.770	0.783	0.780	0.75%	1.75%	0.40%
Portugal	0.152	0.182	0.145	0.152	0.158	0.161	0.166	0.167	-0.46%	0.83%	0.41%
Romania	0.643	0.455	0.454	0.492	0.519	0.528	0.532	0.518	-3.42%	1.35%	-0.01%
Spain	1.188	1.265	1.050	1.093	1.129	1.153	1.179	1.207	-1.23%	0.73%	0.45%
Turkey	0.967	1.346	1.530	1.682	1.792	1.872	1.966	2.053	4.70%	1.60%	0.91%
United Kingdom	3.376	3.337	2.645	2.717	2.781	2.783	2.806	2.752	-2.41%	0.50%	-0.07%
Other Europe	2.324	2.192	1.887	2.015	2.127	2.179	2.191	2.165	-2.06%	1.20%	0.12%
Eurasia	**21.786**	**21.616**	**21.673**	**22.917**	**24.215**	**24.910**	**25.193**	**25.422**	**-0.05%**	**1.12%**	**0.32%**
Kazakhstan	0.477	0.303	0.474	0.556	0.638	0.692	0.732	0.766	-0.05%	3.00%	1.23%
Russia	14.330	15.471	15.275	15.673	16.167	16.289	16.198	16.016	0.64%	0.57%	-0.06%
Turkmenistan	0.629	0.720	0.765	0.928	1.094	1.230	1.347	1.452	1.98%	3.64%	1.90%
Ukraine	3.079	1.969	1.676	1.766	1.844	1.885	1.887	1.861	-5.90%	0.96%	0.06%
Uzbekistan	1.702	1.614	1.890	2.273	2.620	2.886	3.088	3.388	1.05%	3.32%	1.73%
Other Eurasia	1.569	1.538	1.593	1.721	1.852	1.926	1.942	1.939	0.15%	1.52%	0.31%
Middle East	**9.825**	**13.379**	**14.478**	**15.518**	**17.074**	**18.352**	**19.528**	**20.571**	**3.95%**	**1.66%**	**1.25%**
Iran	3.707	5.106	5.244	5.486	5.922	6.306	6.605	6.934	3.53%	1.22%	1.06%
Qatar	0.660	0.796	1.102	1.142	1.225	1.285	1.315	1.336	5.26%	1.06%	0.58%
Oman	0.324	0.620	0.710	0.780	0.860	0.909	0.948	0.974	8.17%	1.93%	0.83%
Saudi Arabia	2.516	3.096	3.510	3.892	4.419	4.844	5.202	5.465	3.39%	2.33%	1.43%
United Arab Emirates	1.457	2.147	2.203	2.296	2.464	2.550	2.706	2.835	4.22%	1.13%	0.94%
Other Middle East	1.160	1.614	1.709	1.921	2.185	2.457	2.753	3.027	3.95%	2.49%	2.20%
Africa	**2.979**	**3.535**	**3.895**	**4.599**	**5.562**	**6.594**	**7.723**	**8.886**	**2.72%**	**3.63%**	**3.17%**
Algeria	0.846	1.024	1.087	1.227	1.426	1.592	1.700	1.784	2.53%	2.75%	1.51%
Egypt	1.208	1.630	1.795	2.033	2.355	2.743	3.286	3.857	4.04%	2.75%	3.34%
Nigeria	0.366	0.178	0.259	0.364	0.538	0.718	0.909	1.117	-3.40%	7.59%	4.99%
Other Africa	0.559	0.702	0.755	0.975	1.243	1.541	1.829	2.129	3.05%	5.12%	3.65%
Asia & Oceania	**13.741**	**20.677**	**24.175**	**30.428**	**35.696**	**39.988**	**43.479**	**44.379**	**5.81%**	**3.97%**	**1.46%**
Australia	1.014	1.249	1.545	1.803	1.922	2.002	2.072	2.156	4.30%	2.21%	0.77%
China	1.655	3.769	6.018	8.784	11.687	14.201	16.103	16.975	13.78%	6.86%	2.52%
India	1.269	2.277	1.959	2.689	3.279	3.923	4.498	4.686	4.44%	5.29%	2.41%
Indonesia	0.638	1.397	1.383	1.656	1.990	2.381	2.738	3.024	8.04%	3.71%	2.83%
Japan	3.110	3.861	4.236	4.473	4.367	4.173	4.105	3.869	3.14%	0.30%	-0.80%
Malaysia	0.914	1.145	1.083	1.287	1.419	1.498	1.525	1.516	1.72%	2.74%	0.44%
Myanmar	0.146	0.114	0.119	0.164	0.216	0.276	0.339	0.371	-2.03%	6.13%	3.68%
Pakistan	1.088	1.400	1.332	1.679	2.034	2.218	2.373	2.455	2.04%	4.33%	1.26%
Singapore	0.233	0.297	0.370	0.409	0.417	0.414	0.406	0.390	4.72%	1.19%	-0.44%
South Korea	1.076	1.524	1.966	2.381	2.591	2.654	2.667	2.577	6.21%	2.80%	-0.04%
Thailand	1.150	1.592	1.838	2.130	2.301	2.366	2.482	2.321	4.80%	2.27%	0.06%
Other Asia & Oceania	1.447	2.051	2.324	2.973	3.473	3.883	4.172	4.038	4.85%	4.10%	1.01%
World	**99.448**	**113.816**	**120.633**	**133.009**	**145.210**	**153.825**	**161.156**	**165.535**	**1.95%**	**1.87%**	**0.88%**

LNG12_HRR Case (Demand)(tcf)

	2005	2010	2015	2020	2025	2030	2035	2040	cagr 2005-15	cagr 2015-25	cagr 2025-40
North America	**26.814**	**29.188**	**32.877**	**35.072**	**37.122**	**37.928**	**38.956**	**40.023**	**2.06%**	**1.22%**	**0.50%**
Canada	3.144	2.815	3.126	3.328	3.490	3.595	3.687	3.749	-0.06%	1.11%	0.48%
Mexico	1.656	2.286	2.497	2.650	2.849	3.058	3.273	3.472	4.19%	1.33%	1.33%
United States	22.014	24.087	27.255	29.093	30.783	31.274	31.995	32.802	2.16%	1.22%	0.42%
Central & South America	**4.208**	**4.897**	**5.729**	**6.179**	**6.890**	**7.456**	**7.862**	**8.201**	**3.13%**	**1.86%**	**1.17%**
Argentina	1.428	1.529	1.612	1.863	2.037	2.175	2.288	2.386	1.22%	2.37%	1.06%
Brazil	0.657	0.890	1.157	1.349	1.557	1.746	1.886	2.007	5.82%	3.02%	1.71%
Chile	0.295	0.187	0.231	0.290	0.333	0.370	0.401	0.426	-2.40%	3.72%	1.65%
Colombia	0.236	0.321	0.393	0.402	0.446	0.491	0.520	0.562	5.25%	1.28%	1.54%
Peru	0.056	0.194	0.220	0.234	0.265	0.291	0.313	0.334	14.71%	1.87%	1.55%
Trinidad and Tobago	0.575	0.824	0.752	0.766	0.776	0.761	0.737	0.712	2.72%	0.32%	-0.57%
Venezuela	0.828	0.748	1.102	0.981	1.133	1.235	1.292	1.342	2.90%	0.28%	1.13%
Other Central & South America	0.135	0.205	0.263	0.293	0.342	0.388	0.426	0.433	6.94%	2.65%	1.59%
Europe	**20.095**	**20.525**	**17.967**	**18.619**	**19.123**	**19.233**	**19.264**	**19.052**	**-1.11%**	**0.63%**	**-0.02%**
Austria	0.354	0.353	0.285	0.294	0.305	0.311	0.315	0.314	-2.12%	0.67%	0.19%
Belgium	0.601	0.700	0.612	0.651	0.689	0.717	0.729	0.730	0.18%	1.20%	0.38%
France	1.740	1.695	1.421	1.420	1.397	1.329	1.291	1.247	-2.01%	-0.17%	-0.75%
Germany	3.203	3.329	3.057	3.095	3.140	3.146	3.083	2.981	-0.47%	0.27%	-0.34%
Italy	3.046	2.935	2.322	2.338	2.351	2.344	2.341	2.318	-2.68%	0.12%	-0.09%
Netherlands	1.741	1.937	1.717	1.740	1.734	1.683	1.635	1.578	-0.14%	0.10%	-0.63%
Norway	0.187	0.194	0.225	0.247	0.264	0.255	0.238	0.224	1.86%	1.59%	-1.07%
Poland	0.573	0.606	0.618	0.682	0.735	0.770	0.784	0.783	0.76%	1.75%	0.43%
Portugal	0.152	0.182	0.145	0.152	0.158	0.161	0.167	0.168	-0.46%	0.83%	0.41%
Romania	0.643	0.455	0.454	0.492	0.519	0.528	0.532	0.519	-3.42%	1.35%	0.00%
Spain	1.188	1.265	1.050	1.093	1.129	1.152	1.181	1.208	-1.23%	0.73%	0.45%
Turkey	0.967	1.346	1.530	1.684	1.793	1.872	1.966	2.053	4.70%	1.60%	0.91%
United Kingdom	3.376	3.337	2.644	2.716	2.782	2.785	2.809	2.760	-2.41%	0.51%	-0.05%
Other Europe	2.324	2.192	1.887	2.015	2.128	2.179	2.194	2.169	-2.06%	1.20%	0.13%
Eurasia	**21.786**	**21.616**	**21.673**	**22.928**	**24.227**	**24.912**	**25.216**	**25.460**	**-0.05%**	**1.12%**	**0.33%**
Kazakhstan	0.477	0.303	0.474	0.557	0.640	0.692	0.731	0.766	-0.05%	3.03%	1.21%
Russia	14.330	15.471	15.275	15.680	16.173	16.290	16.210	16.042	0.64%	0.57%	-0.05%
Turkmenistan	0.629	0.720	0.765	0.928	1.095	1.233	1.352	1.455	1.98%	3.66%	1.91%
Ukraine	3.079	1.969	1.676	1.766	1.846	1.885	1.889	1.863	-5.90%	0.97%	0.06%
Uzbekistan	1.702	1.614	1.890	2.275	2.621	2.885	3.090	3.393	1.05%	3.33%	1.74%
Other Eurasia	1.569	1.538	1.592	1.722	1.852	1.926	1.944	1.941	0.15%	1.52%	0.31%
Middle East	**9.825**	**13.379**	**14.477**	**15.515**	**17.081**	**18.348**	**19.518**	**20.599**	**3.95%**	**1.67%**	**1.26%**
Iran	3.707	5.106	5.243	5.484	5.925	6.301	6.604	6.964	3.53%	1.23%	1.08%
Qatar	0.660	0.796	1.103	1.143	1.226	1.285	1.312	1.330	5.26%	1.07%	0.54%
Oman	0.324	0.620	0.710	0.780	0.860	0.905	0.950	0.981	8.17%	1.93%	0.88%
Saudi Arabia	2.516	3.096	3.510	3.893	4.420	4.848	5.203	5.469	3.39%	2.33%	1.43%
United Arab Emirates	1.457	2.147	2.202	2.295	2.463	2.549	2.702	2.841	4.22%	1.12%	0.96%
Other Middle East	1.160	1.614	1.708	1.920	2.188	2.459	2.747	3.015	3.94%	2.50%	2.16%
Africa	**2.979**	**3.535**	**3.897**	**4.604**	**5.566**	**6.609**	**7.720**	**8.875**	**2.72%**	**3.63%**	**3.16%**
Algeria	0.846	1.024	1.087	1.228	1.426	1.590	1.708	1.784	2.53%	2.75%	1.51%
Egypt	1.208	1.630	1.795	2.035	2.360	2.744	3.288	3.856	4.04%	2.77%	3.33%
Nigeria	0.366	0.178	0.260	0.365	0.536	0.732	0.893	1.102	-3.35%	7.50%	4.92%
Other Africa	0.559	0.702	0.755	0.976	1.244	1.543	1.831	2.133	3.05%	5.12%	3.66%
Asia & Oceania	**13.741**	**20.677**	**24.180**	**30.475**	**35.724**	**40.202**	**43.827**	**44.579**	**5.81%**	**3.98%**	**1.49%**
Australia	1.014	1.249	1.546	1.804	1.918	2.000	2.070	2.149	4.31%	2.18%	0.76%
China	1.655	3.769	6.021	8.810	11.707	14.335	16.214	17.036	13.79%	6.88%	2.53%
India	1.269	2.277	1.959	2.689	3.283	3.945	4.604	4.712	4.44%	5.30%	2.44%
Indonesia	0.638	1.397	1.384	1.657	1.991	2.383	2.740	3.037	8.04%	3.70%	2.86%
Japan	3.110	3.861	4.236	4.483	4.367	4.185	4.177	3.883	3.14%	0.31%	-0.78%
Malaysia	0.914	1.145	1.084	1.286	1.419	1.499	1.526	1.520	1.72%	2.73%	0.46%
Myanmar	0.146	0.114	0.119	0.165	0.216	0.277	0.339	0.374	-2.03%	6.12%	3.73%
Pakistan	1.088	1.400	1.332	1.679	2.036	2.236	2.399	2.471	2.04%	4.34%	1.30%
Singapore	0.233	0.297	0.370	0.409	0.417	0.415	0.406	0.392	4.72%	1.19%	-0.42%
South Korea	1.076	1.524	1.966	2.388	2.591	2.666	2.679	2.589	6.21%	2.80%	-0.01%
Thailand	1.150	1.592	1.838	2.130	2.300	2.370	2.487	2.366	4.80%	2.26%	0.19%
Other Asia & Oceania	1.447	2.051	2.324	2.976	3.479	3.892	4.186	4.049	4.85%	4.12%	1.02%
World	**99.448**	**113.816**	**120.799**	**133.391**	**145.733**	**154.687**	**162.363**	**166.789**	**1.96%**	**1.89%**	**0.90%**

LNG12_LRR Case (Demand)(tcf)

	2005	2010	2015	2020	2025	2030	2035	2040	cagr 2005-15	cagr 2015-25	cagr 2025-40
North America	**26.814**	**29.188**	**32.530**	**34.486**	**36.324**	**36.725**	**37.446**	**38.304**	**1.95%**	**1.11%**	**0.35%**
Canada	3.144	2.815	3.131	3.389	3.510	3.572	3.642	3.694	-0.04%	1.15%	0.34%
Mexico	1.656	2.286	2.477	2.629	2.877	3.106	3.350	3.549	4.11%	1.51%	1.41%
United States	22.014	24.087	26.923	28.468	29.937	30.046	30.454	31.062	2.03%	1.07%	0.25%
Central & South America	**4.208**	**4.897**	**5.728**	**6.179**	**6.886**	**7.455**	**7.864**	**8.184**	**3.13%**	**1.86%**	**1.16%**
Argentina	1.428	1.529	1.612	1.863	2.036	2.175	2.289	2.386	1.22%	2.37%	1.06%
Brazil	0.657	0.890	1.157	1.349	1.556	1.746	1.886	2.007	5.82%	3.01%	1.71%
Chile	0.295	0.187	0.231	0.290	0.333	0.370	0.402	0.426	-2.40%	3.72%	1.66%
Colombia	0.236	0.321	0.393	0.402	0.446	0.491	0.524	0.562	5.25%	1.27%	1.56%
Peru	0.056	0.194	0.219	0.234	0.265	0.291	0.314	0.332	14.66%	1.90%	1.52%
Trinidad and Tobago	0.575	0.824	0.752	0.766	0.776	0.759	0.738	0.707	2.73%	0.31%	-0.61%
Venezuela	0.828	0.748	1.102	0.982	1.133	1.234	1.297	1.334	2.90%	0.28%	1.09%
Other Central & South America	0.135	0.205	0.263	0.293	0.341	0.389	0.413	0.430	6.94%	2.63%	1.55%
Europe	**20.095**	**20.525**	**17.967**	**18.614**	**19.117**	**19.240**	**19.275**	**19.113**	**-1.11%**	**0.62%**	**0.00%**
Austria	0.354	0.353	0.286	0.294	0.305	0.311	0.315	0.315	-2.11%	0.66%	0.21%
Belgium	0.601	0.700	0.612	0.651	0.689	0.717	0.729	0.732	0.18%	1.20%	0.40%
France	1.740	1.695	1.421	1.417	1.396	1.330	1.292	1.253	-2.01%	-0.17%	-0.72%
Germany	3.203	3.329	3.057	3.094	3.139	3.148	3.085	2.988	-0.46%	0.27%	-0.33%
Italy	3.046	2.935	2.322	2.337	2.350	2.344	2.340	2.320	-2.68%	0.12%	-0.08%
Netherlands	1.741	1.937	1.717	1.740	1.734	1.684	1.635	1.580	-0.14%	0.10%	-0.62%
Norway	0.187	0.194	0.225	0.249	0.263	0.255	0.241	0.226	1.87%	1.57%	-0.99%
Poland	0.573	0.606	0.618	0.681	0.734	0.770	0.784	0.786	0.75%	1.75%	0.45%
Portugal	0.152	0.182	0.145	0.152	0.158	0.161	0.166	0.168	-0.46%	0.83%	0.41%
Romania	0.643	0.455	0.454	0.493	0.519	0.528	0.532	0.520	-3.42%	1.35%	0.01%
Spain	1.188	1.265	1.050	1.092	1.129	1.153	1.180	1.209	-1.23%	0.73%	0.46%
Turkey	0.967	1.346	1.530	1.683	1.792	1.872	1.970	2.064	4.70%	1.59%	0.95%
United Kingdom	3.376	3.337	2.644	2.717	2.783	2.786	2.809	2.776	-2.41%	0.51%	-0.02%
Other Europe	2.324	2.192	1.888	2.015	2.126	2.180	2.196	2.177	-2.06%	1.20%	0.16%
Eurasia	**21.786**	**21.616**	**21.674**	**22.932**	**24.223**	**24.916**	**25.228**	**25.491**	**-0.05%**	**1.12%**	**0.34%**
Kazakhstan	0.477	0.303	0.474	0.557	0.640	0.693	0.732	0.767	-0.05%	3.04%	1.22%
Russia	14.330	15.471	15.276	15.683	16.175	16.292	16.216	16.057	0.64%	0.57%	-0.05%
Turkmenistan	0.629	0.720	0.765	0.929	1.094	1.233	1.352	1.457	1.99%	3.64%	1.93%
Ukraine	3.079	1.969	1.677	1.766	1.844	1.885	1.889	1.867	-5.90%	0.96%	0.08%
Uzbekistan	1.702	1.614	1.890	2.276	2.621	2.886	3.091	3.398	1.05%	3.32%	1.75%
Other Eurasia	1.569	1.538	1.592	1.721	1.850	1.927	1.947	1.944	0.15%	1.51%	0.33%
Middle East	**9.825**	**13.379**	**14.477**	**15.520**	**17.082**	**18.361**	**19.528**	**20.567**	**3.95%**	**1.67%**	**1.25%**
Iran	3.707	5.106	5.243	5.489	5.926	6.308	6.606	6.921	3.53%	1.23%	1.04%
Qatar	0.660	0.796	1.102	1.142	1.227	1.286	1.316	1.335	5.26%	1.08%	0.56%
Oman	0.324	0.620	0.710	0.781	0.861	0.908	0.946	0.978	8.17%	1.94%	0.85%
Saudi Arabia	2.516	3.096	3.509	3.893	4.419	4.849	5.206	5.481	3.38%	2.33%	1.45%
United Arab Emirates	1.457	2.147	2.203	2.296	2.464	2.554	2.703	2.812	4.22%	1.13%	0.88%
Other Middle East	1.160	1.614	1.709	1.920	2.185	2.457	2.752	3.042	3.95%	2.49%	2.23%
Africa	**2.979**	**3.535**	**3.897**	**4.603**	**5.561**	**6.600**	**7.750**	**8.915**	**2.72%**	**3.62%**	**3.20%**
Algeria	0.846	1.024	1.087	1.229	1.427	1.593	1.709	1.788	2.53%	2.76%	1.52%
Egypt	1.208	1.630	1.795	2.032	2.357	2.743	3.291	3.855	4.04%	2.76%	3.33%
Nigeria	0.366	0.178	0.260	0.367	0.534	0.723	0.911	1.141	-3.34%	7.44%	5.20%
Other Africa	0.559	0.702	0.755	0.976	1.243	1.540	1.838	2.131	3.05%	5.12%	3.66%
Asia & Oceania	**13.741**	**20.677**	**24.177**	**30.415**	**35.682**	**39.881**	**43.285**	**44.296**	**5.81%**	**3.97%**	**1.45%**
Australia	1.014	1.249	1.546	1.811	1.919	2.001	2.082	2.172	4.31%	2.18%	0.83%
China	1.655	3.769	6.019	8.774	11.697	14.122	16.023	16.926	13.78%	6.87%	2.49%
India	1.269	2.277	1.959	2.689	3.280	3.910	4.450	4.657	4.43%	5.29%	2.36%
Indonesia	0.638	1.397	1.384	1.658	1.991	2.387	2.745	3.034	8.05%	3.70%	2.85%
Japan	3.110	3.861	4.236	4.467	4.365	4.164	4.064	3.855	3.14%	0.30%	-0.82%
Malaysia	0.914	1.145	1.084	1.286	1.417	1.499	1.527	1.522	1.72%	2.72%	0.47%
Myanmar	0.146	0.114	0.119	0.165	0.216	0.277	0.340	0.371	-2.03%	6.13%	3.66%
Pakistan	1.088	1.400	1.332	1.677	2.020	2.210	2.348	2.438	2.04%	4.26%	1.26%
Singapore	0.233	0.297	0.370	0.409	0.417	0.414	0.405	0.390	4.72%	1.19%	-0.45%
South Korea	1.076	1.524	1.966	2.376	2.591	2.646	2.651	2.565	6.21%	2.80%	-0.07%
Thailand	1.150	1.592	1.838	2.130	2.299	2.365	2.483	2.330	4.80%	2.26%	0.09%
Other Asia & Oceania	1.447	2.051	2.324	2.974	3.469	3.886	4.168	4.036	4.85%	4.09%	1.01%
World	**99.448**	**113.816**	**120.451**	**132.751**	**144.875**	**153.178**	**160.375**	**164.870**	**1.93%**	**1.86%**	**0.87%**

LNG12_Hi-D Case (Demand)(tcf)

	2005	2010	2015	2020	2025	2030	2035	2040	cagr 2005-15	cagr 2015-25	cagr 2025-40
North America	**26.814**	**29.188**	**32.844**	**35.640**	**38.346**	**39.597**	**40.486**	**41.375**	**2.05%**	**1.56%**	**0.51%**
Canada	3.144	2.815	3.130	3.374	3.515	3.580	3.663	3.713	-0.05%	1.17%	0.37%
Mexico	1.656	2.286	2.485	2.639	2.858	3.085	3.310	3.532	4.14%	1.41%	1.42%
United States	22.014	24.087	27.230	29.627	31.972	32.932	33.513	34.131	2.15%	1.62%	0.44%
Central & South America	**4.208**	**4.897**	**5.728**	**6.179**	**6.885**	**7.462**	**7.875**	**8.189**	**3.13%**	**1.86%**	**1.16%**
Argentina	1.428	1.529	1.612	1.864	2.035	2.174	2.289	2.390	1.22%	2.36%	1.08%
Brazil	0.657	0.890	1.157	1.349	1.556	1.745	1.887	2.009	5.82%	3.01%	1.72%
Chile	0.295	0.187	0.231	0.290	0.333	0.370	0.402	0.427	-2.40%	3.71%	1.67%
Colombia	0.236	0.321	0.393	0.403	0.445	0.493	0.523	0.562	5.25%	1.25%	1.56%
Peru	0.056	0.194	0.220	0.233	0.264	0.291	0.314	0.331	14.69%	1.87%	1.52%
Trinidad and Tobago	0.575	0.824	0.752	0.765	0.779	0.760	0.740	0.705	2.72%	0.36%	-0.66%
Venezuela	0.828	0.748	1.102	0.982	1.132	1.239	1.301	1.338	2.90%	0.27%	1.12%
Other Central & South America	0.135	0.205	0.263	0.293	0.341	0.390	0.420	0.428	6.93%	2.63%	1.53%
Europe	**20.095**	**20.525**	**17.967**	**18.614**	**19.111**	**19.231**	**19.274**	**19.083**	**-1.11%**	**0.62%**	**-0.01%**
Austria	0.354	0.353	0.286	0.294	0.305	0.311	0.315	0.314	-2.11%	0.66%	0.20%
Belgium	0.601	0.700	0.612	0.651	0.689	0.717	0.729	0.731	0.18%	1.19%	0.40%
France	1.740	1.695	1.421	1.417	1.396	1.328	1.293	1.250	-2.01%	-0.18%	-0.73%
Germany	3.203	3.329	3.057	3.094	3.138	3.146	3.085	2.984	-0.46%	0.26%	-0.34%
Italy	3.046	2.935	2.322	2.337	2.349	2.344	2.341	2.319	-2.68%	0.11%	-0.09%
Netherlands	1.741	1.937	1.717	1.740	1.734	1.682	1.636	1.579	-0.14%	0.10%	-0.62%
Norway	0.187	0.194	0.225	0.248	0.264	0.256	0.239	0.227	1.86%	1.62%	-1.00%
Poland	0.573	0.606	0.618	0.682	0.734	0.769	0.785	0.784	0.75%	1.74%	0.44%
Portugal	0.152	0.182	0.145	0.152	0.158	0.161	0.167	0.168	-0.46%	0.83%	0.41%
Romania	0.643	0.455	0.454	0.493	0.519	0.528	0.533	0.518	-3.42%	1.34%	0.00%
Spain	1.188	1.265	1.050	1.092	1.129	1.152	1.181	1.208	-1.23%	0.73%	0.45%
Turkey	0.967	1.346	1.530	1.683	1.790	1.871	1.965	2.056	4.70%	1.58%	0.93%
United Kingdom	3.376	3.337	2.644	2.716	2.782	2.786	2.812	2.772	-2.41%	0.51%	-0.02%
Other Europe	2.324	2.192	1.887	2.015	2.125	2.179	2.195	2.173	-2.06%	1.19%	0.15%
Eurasia	**21.786**	**21.616**	**21.673**	**22.937**	**24.203**	**24.908**	**25.223**	**25.456**	**-0.05%**	**1.11%**	**0.34%**
Kazakhstan	0.477	0.303	0.474	0.557	0.638	0.693	0.734	0.768	-0.05%	3.01%	1.24%
Russia	14.330	15.471	15.276	15.688	16.160	16.288	16.215	16.035	0.64%	0.56%	-0.05%
Turkmenistan	0.629	0.720	0.765	0.928	1.092	1.229	1.350	1.453	1.98%	3.62%	1.92%
Ukraine	3.079	1.969	1.676	1.766	1.845	1.886	1.888	1.864	-5.90%	0.96%	0.07%
Uzbekistan	1.702	1.614	1.890	2.276	2.618	2.885	3.091	3.395	1.05%	3.32%	1.75%
Other Eurasia	1.569	1.538	1.592	1.722	1.850	1.927	1.945	1.942	0.15%	1.51%	0.32%
Middle East	**9.825**	**13.379**	**14.481**	**15.520**	**17.080**	**18.356**	**19.519**	**20.574**	**3.96%**	**1.66%**	**1.25%**
Iran	3.707	5.106	5.244	5.489	5.925	6.304	6.605	6.947	3.53%	1.23%	1.07%
Qatar	0.660	0.796	1.102	1.142	1.227	1.286	1.316	1.325	5.26%	1.08%	0.52%
Oman	0.324	0.620	0.710	0.780	0.860	0.908	0.948	0.976	8.17%	1.93%	0.85%
Saudi Arabia	2.516	3.096	3.510	3.893	4.419	4.845	5.203	5.465	3.39%	2.33%	1.43%
United Arab Emirates	1.457	2.147	2.203	2.296	2.464	2.553	2.699	2.837	4.22%	1.13%	0.94%
Other Middle East	1.160	1.614	1.711	1.920	2.184	2.461	2.748	3.023	3.96%	2.47%	2.19%
Africa	**2.979**	**3.535**	**3.896**	**4.602**	**5.563**	**6.591**	**7.737**	**8.889**	**2.72%**	**3.62%**	**3.17%**
Algeria	0.846	1.024	1.087	1.228	1.426	1.592	1.708	1.786	2.53%	2.75%	1.51%
Egypt	1.208	1.630	1.795	2.033	2.354	2.741	3.292	3.858	4.04%	2.75%	3.35%
Nigeria	0.366	0.178	0.260	0.366	0.540	0.717	0.903	1.112	-3.36%	7.58%	4.94%
Other Africa	0.559	0.702	0.755	0.976	1.244	1.541	1.834	2.133	3.05%	5.12%	3.66%
Asia & Oceania	**13.741**	**20.677**	**24.177**	**30.436**	**35.705**	**39.945**	**43.380**	**44.314**	**5.81%**	**3.98%**	**1.45%**
Australia	1.014	1.249	1.546	1.810	1.921	2.000	2.077	2.163	4.31%	2.19%	0.79%
China	1.655	3.769	6.019	8.786	11.698	14.167	16.061	16.951	13.79%	6.87%	2.50%
India	1.269	2.277	1.959	2.689	3.281	3.916	4.469	4.666	4.44%	5.29%	2.38%
Indonesia	0.638	1.397	1.384	1.658	1.993	2.385	2.746	3.033	8.04%	3.71%	2.84%
Japan	3.110	3.861	4.236	4.471	4.365	4.169	4.075	3.861	3.14%	0.30%	-0.82%
Malaysia	0.914	1.145	1.084	1.287	1.418	1.501	1.529	1.517	1.72%	2.72%	0.45%
Myanmar	0.146	0.114	0.119	0.165	0.216	0.277	0.339	0.371	-2.02%	6.15%	3.66%
Pakistan	1.088	1.400	1.332	1.678	2.034	2.219	2.360	2.444	2.04%	4.33%	1.23%
Singapore	0.233	0.297	0.370	0.409	0.417	0.414	0.405	0.390	4.72%	1.20%	-0.44%
South Korea	1.076	1.524	1.966	2.379	2.590	2.650	2.658	2.570	6.21%	2.80%	-0.05%
Thailand	1.150	1.592	1.838	2.130	2.301	2.366	2.482	2.316	4.80%	2.27%	0.04%
Other Asia & Oceania	1.447	2.051	2.324	2.975	3.472	3.882	4.178	4.033	4.85%	4.10%	1.00%
World	**99.448**	**113.816**	**120.767**	**133.929**	**146.892**	**156.090**	**163.494**	**167.880**	**1.96%**	**1.98%**	**0.89%**

LNG20_Ref Case (Demand)(tcf)

	2005	2010	2015	2020	2025	2030	2035	2040	cagr 2005-15	cagr 2015-25	cagr 2025-40
North America	**26.814**	**29.188**	**32.700**	**34.667**	**36.600**	**37.238**	**38.118**	**39.053**	**2.00%**	**1.13%**	**0.43%**
Canada	3.144	2.815	3.129	3.368	3.511	3.579	3.641	3.692	-0.05%	1.16%	0.34%
Mexico	1.656	2.286	2.485	2.641	2.859	3.098	3.329	3.519	4.14%	1.41%	1.40%
United States	22.014	24.087	27.086	28.658	30.229	30.561	31.148	31.841	2.10%	1.10%	0.35%
Central & South America	**4.208**	**4.897**	**5.729**	**6.182**	**6.887**	**7.453**	**7.856**	**8.182**	**3.13%**	**1.86%**	**1.16%**
Argentina	1.428	1.529	1.612	1.863	2.037	2.175	2.288	2.386	1.22%	2.37%	1.06%
Brazil	0.657	0.890	1.157	1.349	1.557	1.745	1.885	2.006	5.82%	3.01%	1.71%
Chile	0.295	0.187	0.231	0.290	0.333	0.370	0.401	0.426	-2.40%	3.73%	1.66%
Colombia	0.236	0.321	0.393	0.402	0.446	0.491	0.521	0.561	5.25%	1.28%	1.53%
Peru	0.056	0.194	0.220	0.234	0.264	0.291	0.314	0.333	14.72%	1.81%	1.58%
Trinidad and Tobago	0.575	0.824	0.752	0.770	0.778	0.759	0.738	0.712	2.72%	0.35%	-0.59%
Venezuela	0.828	0.748	1.102	0.980	1.133	1.236	1.297	1.331	2.90%	0.28%	1.08%
Other Central & South America	0.135	0.205	0.263	0.293	0.340	0.386	0.411	0.427	6.93%	2.59%	1.54%
Europe	**20.095**	**20.525**	**17.964**	**18.599**	**19.088**	**19.214**	**19.265**	**19.038**	**-1.11%**	**0.61%**	**-0.02%**
Austria	0.354	0.353	0.286	0.294	0.305	0.311	0.315	0.314	-2.11%	0.65%	0.21%
Belgium	0.601	0.700	0.612	0.651	0.688	0.717	0.729	0.729	0.18%	1.18%	0.39%
France	1.740	1.695	1.421	1.415	1.387	1.327	1.292	1.244	-2.01%	-0.24%	-0.72%
Germany	3.203	3.329	3.057	3.090	3.133	3.145	3.086	2.986	-0.46%	0.25%	-0.32%
Italy	3.046	2.935	2.322	2.334	2.348	2.341	2.335	2.317	-2.68%	0.11%	-0.09%
Netherlands	1.741	1.937	1.717	1.741	1.733	1.681	1.635	1.576	-0.14%	0.09%	-0.63%
Norway	0.187	0.194	0.225	0.248	0.264	0.254	0.239	0.224	1.85%	1.64%	-1.11%
Poland	0.573	0.606	0.617	0.684	0.737	0.771	0.786	0.786	0.74%	1.79%	0.42%
Portugal	0.152	0.182	0.145	0.152	0.157	0.161	0.166	0.167	-0.46%	0.82%	0.41%
Romania	0.643	0.455	0.454	0.493	0.519	0.528	0.532	0.519	-3.41%	1.34%	0.01%
Spain	1.188	1.265	1.050	1.092	1.127	1.151	1.180	1.207	-1.23%	0.72%	0.46%
Turkey	0.967	1.346	1.526	1.676	1.785	1.864	1.965	2.055	4.67%	1.58%	0.94%
United Kingdom	3.376	3.337	2.645	2.717	2.779	2.783	2.809	2.744	-2.41%	0.50%	-0.09%
Other Europe	2.324	2.192	1.887	2.013	2.125	2.179	2.197	2.170	-2.06%	1.19%	0.14%
Eurasia	**21.786**	**21.616**	**21.673**	**22.926**	**24.191**	**24.845**	**25.151**	**25.360**	**-0.05%**	**1.10%**	**0.32%**
Kazakhstan	0.477	0.303	0.474	0.555	0.638	0.690	0.730	0.764	-0.05%	3.00%	1.21%
Russia	14.330	15.471	15.275	15.678	16.140	16.232	16.148	15.945	0.64%	0.55%	-0.08%
Turkmenistan	0.629	0.720	0.765	0.927	1.091	1.223	1.345	1.448	1.98%	3.61%	1.91%
Ukraine	3.079	1.969	1.677	1.764	1.844	1.885	1.889	1.867	-5.90%	0.96%	0.08%
Uzbekistan	1.702	1.614	1.890	2.277	2.624	2.887	3.093	3.393	1.05%	3.34%	1.73%
Other Eurasia	1.569	1.538	1.592	1.724	1.855	1.928	1.946	1.943	0.15%	1.54%	0.31%
Middle East	**9.825**	**13.379**	**14.479**	**15.516**	**17.078**	**18.353**	**19.518**	**20.595**	**3.95%**	**1.66%**	**1.26%**
Iran	3.707	5.106	5.243	5.489	5.929	6.300	6.601	6.941	3.53%	1.24%	1.06%
Qatar	0.660	0.796	1.103	1.143	1.228	1.285	1.314	1.337	5.26%	1.08%	0.57%
Oman	0.324	0.620	0.710	0.780	0.858	0.908	0.946	0.979	8.17%	1.91%	0.88%
Saudi Arabia	2.516	3.096	3.510	3.893	4.420	4.848	5.201	5.465	3.39%	2.33%	1.43%
United Arab Emirates	1.457	2.147	2.202	2.296	2.456	2.551	2.708	2.834	4.22%	1.10%	0.96%
Other Middle East	1.160	1.614	1.711	1.914	2.187	2.460	2.747	3.039	3.96%	2.48%	2.22%
Africa	**2.979**	**3.535**	**3.898**	**4.609**	**5.565**	**6.603**	**7.741**	**8.855**	**2.73%**	**3.62%**	**3.15%**
Algeria	0.846	1.024	1.087	1.229	1.427	1.592	1.710	1.786	2.53%	2.76%	1.51%
Egypt	1.208	1.630	1.795	2.029	2.355	2.741	3.280	3.815	4.04%	2.75%	3.27%
Nigeria	0.366	0.178	0.262	0.375	0.539	0.725	0.923	1.142	-3.30%	7.49%	5.13%
Other Africa	0.559	0.702	0.755	0.976	1.244	1.545	1.828	2.112	3.05%	5.13%	3.59%
Asia & Oceania	**13.741**	**20.677**	**24.171**	**31.091**	**36.280**	**40.994**	**44.777**	**45.578**	**5.81%**	**4.14%**	**1.53%**
Australia	1.014	1.249	1.545	1.819	1.920	2.000	2.076	2.122	4.30%	2.20%	0.67%
China	1.655	3.769	6.021	9.098	12.089	14.897	17.222	18.183	13.79%	7.22%	2.76%
India	1.269	2.277	1.959	2.805	3.374	3.997	4.586	4.766	4.44%	5.59%	2.33%
Indonesia	0.638	1.397	1.384	1.658	1.990	2.389	2.740	3.020	8.04%	3.70%	2.82%
Japan	3.110	3.861	4.233	4.453	4.276	4.108	4.051	3.808	3.13%	0.10%	-0.77%
Malaysia	0.914	1.145	1.084	1.309	1.445	1.535	1.559	1.484	1.72%	2.92%	0.18%
Myanmar	0.146	0.114	0.119	0.164	0.215	0.281	0.337	0.360	-2.03%	6.08%	3.50%
Pakistan	1.088	1.400	1.331	1.677	2.024	2.218	2.331	2.372	2.04%	4.28%	1.06%
Singapore	0.233	0.297	0.370	0.418	0.426	0.423	0.413	0.396	4.72%	1.41%	-0.49%
South Korea	1.076	1.524	1.965	2.430	2.597	2.699	2.719	2.607	6.20%	2.83%	0.03%
Thailand	1.150	1.592	1.838	2.184	2.350	2.428	2.503	2.295	4.80%	2.49%	-0.16%
Other Asia & Oceania	1.447	2.051	2.322	3.077	3.574	4.019	4.240	4.164	4.84%	4.41%	1.02%
World	**99.448**	**113.816**	**120.615**	**133.588**	**145.688**	**154.700**	**162.426**	**166.660**	**1.95%**	**1.91%**	**0.90%**

LNG20_HRR Case (Demand)(tcf)

	2005	2010	2015	2020	2025	2030	2035	2040	cagr 2005-15	cagr 2015-25	cagr 2025-40
North America	**26.814**	**29.188**	**32.843**	**35.060**	**37.045**	**37.875**	**38.935**	**40.003**	**2.05%**	**1.21%**	**0.51%**
Canada	3.144	2.815	3.124	3.333	3.491	3.599	3.662	3.725	-0.06%	1.12%	0.43%
Mexico	1.656	2.286	2.494	2.652	2.846	3.065	3.290	3.493	4.18%	1.33%	1.37%
United States	22.014	24.087	27.224	29.075	30.708	31.210	31.983	32.786	2.15%	1.21%	0.44%
Central & South America	**4.208**	**4.897**	**5.726**	**6.180**	**6.881**	**7.445**	**7.858**	**8.208**	**3.13%**	**1.86%**	**1.18%**
Argentina	1.428	1.529	1.612	1.863	2.034	2.171	2.287	2.391	1.22%	2.36%	1.08%
Brazil	0.657	0.890	1.157	1.349	1.555	1.743	1.885	2.011	5.82%	3.00%	1.73%
Chile	0.295	0.187	0.231	0.290	0.333	0.369	0.401	0.426	-2.39%	3.71%	1.66%
Colombia	0.236	0.321	0.393	0.403	0.445	0.491	0.521	0.562	5.25%	1.26%	1.56%
Peru	0.056	0.194	0.218	0.234	0.264	0.291	0.314	0.333	14.62%	1.92%	1.56%
Trinidad and Tobago	0.575	0.824	0.750	0.768	0.777	0.758	0.739	0.707	2.70%	0.36%	-0.63%
Venezuela	0.828	0.748	1.102	0.980	1.133	1.233	1.295	1.349	2.90%	0.28%	1.17%
Other Central & South America	0.135	0.205	0.263	0.293	0.340	0.388	0.415	0.428	6.93%	2.59%	1.55%
Europe	**20.095**	**20.525**	**17.963**	**18.599**	**19.088**	**19.221**	**19.268**	**19.064**	**-1.12%**	**0.61%**	**-0.01%**
Austria	0.354	0.353	0.286	0.294	0.305	0.311	0.315	0.314	-2.11%	0.65%	0.20%
Belgium	0.601	0.700	0.612	0.651	0.688	0.717	0.729	0.730	0.18%	1.18%	0.40%
France	1.740	1.695	1.421	1.415	1.387	1.328	1.293	1.248	-2.01%	-0.24%	-0.71%
Germany	3.203	3.329	3.057	3.090	3.133	3.146	3.086	2.985	-0.46%	0.25%	-0.32%
Italy	3.046	2.935	2.322	2.334	2.348	2.341	2.336	2.316	-2.68%	0.11%	-0.09%
Netherlands	1.741	1.937	1.717	1.740	1.733	1.683	1.635	1.578	-0.14%	0.09%	-0.62%
Norway	0.187	0.194	0.225	0.251	0.264	0.255	0.237	0.226	1.87%	1.60%	-1.02%
Poland	0.573	0.606	0.617	0.684	0.737	0.772	0.786	0.785	0.74%	1.79%	0.42%
Portugal	0.152	0.182	0.145	0.152	0.157	0.161	0.167	0.167	-0.46%	0.82%	0.41%
Romania	0.643	0.455	0.454	0.493	0.519	0.528	0.532	0.519	-3.42%	1.34%	0.00%
Spain	1.188	1.265	1.050	1.092	1.127	1.152	1.181	1.207	-1.23%	0.72%	0.46%
Turkey	0.967	1.346	1.526	1.676	1.784	1.864	1.965	2.055	4.67%	1.58%	0.95%
United Kingdom	3.376	3.337	2.645	2.716	2.780	2.783	2.809	2.761	-2.41%	0.50%	-0.04%
Other Europe	2.324	2.192	1.887	2.013	2.125	2.180	2.196	2.172	-2.06%	1.20%	0.15%
Eurasia	**21.786**	**21.616**	**21.674**	**22.922**	**24.193**	**24.856**	**25.155**	**25.337**	**-0.05%**	**1.11%**	**0.31%**
Kazakhstan	0.477	0.303	0.474	0.555	0.637	0.691	0.730	0.761	-0.05%	3.00%	1.19%
Russia	14.330	15.471	15.275	15.676	16.140	16.235	16.154	15.931	0.64%	0.55%	-0.09%
Turkmenistan	0.629	0.720	0.765	0.928	1.093	1.227	1.342	1.444	1.99%	3.63%	1.87%
Ukraine	3.079	1.969	1.677	1.764	1.845	1.886	1.888	1.865	-5.90%	0.96%	0.07%
Uzbekistan	1.702	1.614	1.890	2.277	2.624	2.889	3.094	3.392	1.05%	3.33%	1.73%
Other Eurasia	1.569	1.538	1.592	1.723	1.854	1.928	1.947	1.944	0.15%	1.53%	0.32%
Middle East	**9.825**	**13.379**	**14.477**	**15.510**	**17.079**	**18.351**	**19.527**	**20.561**	**3.95%**	**1.67%**	**1.24%**
Iran	3.707	5.106	5.243	5.486	5.926	6.304	6.607	6.936	3.53%	1.23%	1.06%
Qatar	0.660	0.796	1.102	1.143	1.230	1.286	1.316	1.328	5.26%	1.10%	0.51%
Oman	0.324	0.620	0.710	0.780	0.858	0.907	0.951	0.978	8.17%	1.90%	0.88%
Saudi Arabia	2.516	3.096	3.510	3.893	4.419	4.847	5.202	5.471	3.39%	2.33%	1.43%
United Arab Emirates	1.457	2.147	2.202	2.295	2.460	2.553	2.704	2.824	4.22%	1.11%	0.92%
Other Middle East	1.160	1.614	1.708	1.913	2.186	2.455	2.747	3.024	3.94%	2.50%	2.19%
Africa	**2.979**	**3.535**	**3.897**	**4.610**	**5.569**	**6.587**	**7.721**	**8.843**	**2.72%**	**3.63%**	**3.13%**
Algeria	0.846	1.024	1.087	1.229	1.427	1.592	1.711	1.786	2.53%	2.76%	1.51%
Egypt	1.208	1.630	1.795	2.032	2.359	2.738	3.277	3.818	4.04%	2.77%	3.26%
Nigeria	0.366	0.178	0.261	0.374	0.540	0.718	0.909	1.133	-3.31%	7.52%	5.07%
Other Africa	0.559	0.702	0.755	0.975	1.244	1.539	1.825	2.105	3.05%	5.13%	3.57%
Asia & Oceania	**13.741**	**20.677**	**24.164**	**31.100**	**36.323**	**41.129**	**45.015**	**46.116**	**5.81%**	**4.16%**	**1.60%**
Australia	1.014	1.249	1.546	1.819	1.921	2.000	2.075	2.123	4.31%	2.19%	0.67%
China	1.655	3.769	6.017	9.103	12.114	14.956	17.342	18.448	13.78%	7.25%	2.84%
India	1.269	2.277	1.959	2.806	3.377	4.030	4.636	4.876	4.44%	5.60%	2.48%
Indonesia	0.638	1.397	1.384	1.659	1.989	2.388	2.736	3.026	8.04%	3.70%	2.84%
Japan	3.110	3.861	4.231	4.450	4.282	4.136	4.076	3.849	3.13%	0.12%	-0.71%
Malaysia	0.914	1.145	1.084	1.309	1.445	1.538	1.558	1.475	1.72%	2.92%	0.14%
Myanmar	0.146	0.114	0.119	0.164	0.214	0.282	0.338	0.363	-2.03%	6.02%	3.59%
Pakistan	1.088	1.400	1.332	1.678	2.031	2.209	2.360	2.425	2.04%	4.31%	1.19%
Singapore	0.233	0.297	0.370	0.418	0.426	0.424	0.413	0.398	4.72%	1.41%	-0.45%
South Korea	1.076	1.524	1.963	2.428	2.601	2.712	2.737	2.643	6.19%	2.85%	0.11%
Thailand	1.150	1.592	1.838	2.184	2.351	2.429	2.508	2.293	4.80%	2.49%	-0.17%
Other Asia & Oceania	1.447	2.051	2.321	3.081	3.573	4.025	4.236	4.197	4.84%	4.41%	1.08%
World	**99.448**	**113.816**	**120.744**	**133.981**	**146.177**	**155.464**	**163.478**	**168.131**	**1.96%**	**1.93%**	**0.94%**

LNG20_LRR Case (Demand)(tcf)

	2005	2010	2015	2020	2025	2030	2035	2040	cagr 2005-15	cagr 2015-25	cagr 2025-40
North America	**26.814**	**29.188**	**32.504**	**34.433**	**36.244**	**36.627**	**37.308**	**38.071**	**1.94%**	**1.10%**	**0.33%**
Canada	3.144	2.815	3.133	3.392	3.511	3.562	3.611	3.665	-0.04%	1.15%	0.29%
Mexico	1.656	2.286	2.479	2.639	2.886	3.129	3.364	3.505	4.11%	1.53%	1.30%
United States	22.014	24.087	26.893	28.401	29.847	29.937	30.333	30.900	2.02%	1.05%	0.23%
Central & South America	**4.208**	**4.897**	**5.728**	**6.180**	**6.883**	**7.446**	**7.857**	**8.185**	**3.13%**	**1.85%**	**1.16%**
Argentina	1.428	1.529	1.612	1.864	2.036	2.174	2.289	2.384	1.22%	2.37%	1.06%
Brazil	0.657	0.890	1.157	1.350	1.556	1.744	1.886	2.005	5.82%	3.01%	1.70%
Chile	0.295	0.187	0.231	0.290	0.333	0.370	0.402	0.426	-2.40%	3.72%	1.65%
Colombia	0.236	0.321	0.393	0.402	0.446	0.491	0.525	0.563	5.25%	1.27%	1.57%
Peru	0.056	0.194	0.219	0.233	0.263	0.291	0.314	0.331	14.65%	1.86%	1.53%
Trinidad and Tobago	0.575	0.824	0.752	0.769	0.776	0.758	0.735	0.707	2.73%	0.32%	-0.62%
Venezuela	0.828	0.748	1.102	0.980	1.133	1.235	1.299	1.335	2.90%	0.28%	1.10%
Other Central & South America	0.135	0.205	0.262	0.292	0.339	0.383	0.408	0.434	6.91%	2.60%	1.67%
Europe	**20.095**	**20.525**	**17.964**	**18.584**	**19.084**	**19.206**	**19.287**	**19.031**	**-1.11%**	**0.61%**	**-0.02%**
Austria	0.354	0.353	0.286	0.293	0.305	0.311	0.315	0.314	-2.11%	0.65%	0.20%
Belgium	0.601	0.700	0.612	0.650	0.688	0.717	0.730	0.729	0.18%	1.18%	0.38%
France	1.740	1.695	1.421	1.412	1.387	1.326	1.295	1.243	-2.01%	-0.24%	-0.73%
Germany	3.203	3.329	3.057	3.087	3.133	3.144	3.090	2.985	-0.46%	0.25%	-0.32%
Italy	3.046	2.935	2.322	2.333	2.348	2.339	2.336	2.316	-2.68%	0.11%	-0.09%
Netherlands	1.741	1.937	1.717	1.740	1.732	1.681	1.636	1.575	-0.14%	0.09%	-0.63%
Norway	0.187	0.194	0.225	0.251	0.265	0.254	0.239	0.226	1.87%	1.63%	-1.05%
Poland	0.573	0.606	0.617	0.684	0.737	0.771	0.787	0.785	0.74%	1.79%	0.43%
Portugal	0.152	0.182	0.145	0.152	0.157	0.161	0.166	0.167	-0.46%	0.82%	0.41%
Romania	0.643	0.455	0.454	0.492	0.519	0.527	0.532	0.519	-3.42%	1.35%	0.00%
Spain	1.188	1.265	1.050	1.091	1.127	1.150	1.181	1.206	-1.23%	0.72%	0.45%
Turkey	0.967	1.346	1.527	1.674	1.783	1.864	1.967	2.055	4.67%	1.56%	0.95%
United Kingdom	3.376	3.337	2.644	2.716	2.779	2.782	2.813	2.741	-2.41%	0.50%	-0.09%
Other Europe	2.324	2.192	1.887	2.010	2.124	2.178	2.199	2.169	-2.06%	1.19%	0.14%
Eurasia	**21.786**	**21.616**	**21.673**	**22.911**	**24.183**	**24.850**	**25.171**	**25.362**	**-0.05%**	**1.10%**	**0.32%**
Kazakhstan	0.477	0.303	0.474	0.555	0.637	0.691	0.729	0.764	-0.05%	3.00%	1.22%
Russia	14.330	15.471	15.274	15.668	16.135	16.235	16.166	15.951	0.64%	0.55%	-0.08%
Turkmenistan	0.629	0.720	0.765	0.928	1.091	1.223	1.345	1.446	1.98%	3.61%	1.90%
Ukraine	3.079	1.969	1.677	1.762	1.844	1.885	1.890	1.865	-5.90%	0.95%	0.08%
Uzbekistan	1.702	1.614	1.890	2.275	2.622	2.887	3.095	3.394	1.05%	3.33%	1.74%
Other Eurasia	1.569	1.538	1.592	1.723	1.854	1.928	1.946	1.941	0.15%	1.53%	0.31%
Middle East	**9.825**	**13.379**	**14.479**	**15.511**	**17.070**	**18.366**	**19.534**	**20.621**	**3.95%**	**1.66%**	**1.27%**
Iran	3.707	5.106	5.243	5.487	5.926	6.309	6.606	6.958	3.53%	1.23%	1.08%
Qatar	0.660	0.796	1.103	1.143	1.228	1.285	1.311	1.340	5.26%	1.08%	0.59%
Oman	0.324	0.620	0.710	0.780	0.856	0.910	0.945	0.973	8.17%	1.88%	0.86%
Saudi Arabia	2.516	3.096	3.511	3.893	4.421	4.852	5.206	5.470	3.39%	2.33%	1.43%
United Arab Emirates	1.457	2.147	2.202	2.296	2.455	2.554	2.711	2.841	4.22%	1.09%	0.98%
Other Middle East	1.160	1.614	1.710	1.912	2.184	2.456	2.755	3.038	3.96%	2.47%	2.23%
Africa	**2.979**	**3.535**	**3.898**	**4.610**	**5.567**	**6.604**	**7.733**	**8.846**	**2.73%**	**3.63%**	**3.14%**
Algeria	0.846	1.024	1.087	1.229	1.427	1.594	1.716	1.783	2.53%	2.76%	1.49%
Egypt	1.208	1.630	1.795	2.030	2.358	2.742	3.275	3.811	4.04%	2.77%	3.25%
Nigeria	0.366	0.178	0.262	0.376	0.539	0.722	0.912	1.139	-3.29%	7.49%	5.11%
Other Africa	0.559	0.702	0.755	0.975	1.242	1.547	1.829	2.113	3.05%	5.11%	3.60%
Asia & Oceania	**13.741**	**20.677**	**24.173**	**31.040**	**36.239**	**40.827**	**44.536**	**45.079**	**5.81%**	**4.13%**	**1.47%**
Australia	1.014	1.249	1.545	1.820	1.921	2.004	2.077	2.117	4.30%	2.20%	0.65%
China	1.655	3.769	6.019	9.073	12.077	14.839	17.089	17.943	13.79%	7.21%	2.67%
India	1.269	2.277	1.959	2.803	3.367	3.958	4.545	4.694	4.44%	5.56%	2.24%
Indonesia	0.638	1.397	1.384	1.658	1.989	2.388	2.755	3.034	8.04%	3.69%	2.86%
Japan	3.110	3.861	4.235	4.443	4.274	4.074	4.024	3.778	3.14%	0.09%	-0.82%
Malaysia	0.914	1.145	1.084	1.308	1.445	1.534	1.561	1.431	1.72%	2.92%	-0.07%
Myanmar	0.146	0.114	0.119	0.164	0.215	0.281	0.338	0.357	-2.04%	6.07%	3.46%
Pakistan	1.088	1.400	1.331	1.675	2.013	2.209	2.299	2.333	2.04%	4.22%	0.99%
Singapore	0.233	0.297	0.370	0.419	0.426	0.423	0.413	0.391	4.72%	1.40%	-0.56%
South Korea	1.076	1.524	1.966	2.422	2.595	2.686	2.699	2.581	6.21%	2.81%	-0.04%
Thailand	1.150	1.592	1.838	2.184	2.350	2.422	2.507	2.282	4.80%	2.49%	-0.20%
Other Asia & Oceania	1.447	2.051	2.322	3.073	3.569	4.008	4.229	4.139	4.84%	4.39%	0.99%
World	**99.448**	**113.816**	**120.419**	**133.269**	**145.269**	**153.926**	**161.427**	**165.195**	**1.93%**	**1.89%**	**0.86%**

LNG20_Hi-D Case (Demand)(tcf)

	2005	2010	2015	2020	2025	2030	2035	2040	cagr 2005-15	cagr 2015-25	cagr 2025-40
North America	**26.814**	**29.188**	**32.823**	**35.558**	**38.272**	**39.545**	**40.396**	**41.257**	**2.04%**	**1.55%**	**0.50%**
Canada	3.144	2.815	3.131	3.381	3.512	3.571	3.635	3.687	-0.04%	1.15%	0.33%
Mexico	1.656	2.286	2.483	2.634	2.869	3.101	3.349	3.512	4.13%	1.46%	1.36%
United States	22.014	24.087	27.208	29.544	31.891	32.873	33.412	34.058	2.14%	1.60%	0.44%
Central & South America	**4.208**	**4.897**	**5.727**	**6.179**	**6.882**	**7.458**	**7.865**	**8.206**	**3.13%**	**1.85%**	**1.18%**
Argentina	1.428	1.529	1.612	1.863	2.036	2.175	2.289	2.391	1.22%	2.37%	1.08%
Brazil	0.657	0.890	1.157	1.349	1.557	1.745	1.888	2.008	5.82%	3.01%	1.71%
Chile	0.295	0.187	0.231	0.290	0.333	0.370	0.402	0.427	-2.40%	3.72%	1.67%
Colombia	0.236	0.321	0.393	0.402	0.445	0.494	0.523	0.561	5.25%	1.25%	1.56%
Peru	0.056	0.194	0.219	0.234	0.263	0.292	0.314	0.333	14.64%	1.88%	1.58%
Trinidad and Tobago	0.575	0.824	0.751	0.769	0.776	0.758	0.737	0.706	2.72%	0.32%	-0.63%
Venezuela	0.828	0.748	1.102	0.980	1.133	1.240	1.302	1.347	2.90%	0.28%	1.16%
Other Central & South America	0.135	0.205	0.262	0.292	0.339	0.384	0.411	0.433	6.91%	2.58%	1.65%
Europe	**20.095**	**20.525**	**17.965**	**18.602**	**19.102**	**19.223**	**19.276**	**19.067**	**-1.11%**	**0.62%**	**-0.01%**
Austria	0.354	0.353	0.286	0.294	0.305	0.311	0.315	0.314	-2.11%	0.65%	0.20%
Belgium	0.601	0.700	0.612	0.651	0.689	0.717	0.730	0.730	0.18%	1.19%	0.39%
France	1.740	1.695	1.421	1.415	1.390	1.328	1.294	1.248	-2.01%	-0.22%	-0.71%
Germany	3.203	3.329	3.057	3.091	3.136	3.147	3.088	2.987	-0.46%	0.26%	-0.32%
Italy	3.046	2.935	2.322	2.334	2.348	2.341	2.336	2.316	-2.68%	0.11%	-0.09%
Netherlands	1.741	1.937	1.717	1.741	1.734	1.682	1.636	1.578	-0.14%	0.10%	-0.63%
Norway	0.187	0.194	0.225	0.249	0.265	0.255	0.240	0.225	1.86%	1.64%	-1.08%
Poland	0.573	0.606	0.617	0.685	0.737	0.772	0.786	0.786	0.74%	1.79%	0.43%
Portugal	0.152	0.182	0.145	0.152	0.157	0.161	0.166	0.167	-0.46%	0.82%	0.41%
Romania	0.643	0.455	0.454	0.493	0.519	0.528	0.533	0.519	-3.42%	1.35%	0.00%
Spain	1.188	1.265	1.050	1.092	1.128	1.151	1.179	1.207	-1.23%	0.72%	0.45%
Turkey	0.967	1.346	1.526	1.676	1.785	1.865	1.965	2.056	4.67%	1.58%	0.95%
United Kingdom	3.376	3.337	2.644	2.716	2.782	2.785	2.812	2.761	-2.41%	0.51%	-0.05%
Other Europe	2.324	2.192	1.888	2.013	2.127	2.180	2.198	2.172	-2.06%	1.20%	0.14%
Eurasia	**21.786**	**21.616**	**21.674**	**22.935**	**24.191**	**24.847**	**25.147**	**25.365**	**-0.05%**	**1.10%**	**0.32%**
Kazakhstan	0.477	0.303	0.474	0.555	0.637	0.690	0.729	0.763	-0.05%	2.99%	1.21%
Russia	14.330	15.471	15.275	15.684	16.140	16.232	16.150	15.957	0.64%	0.55%	-0.08%
Turkmenistan	0.629	0.720	0.765	0.929	1.092	1.224	1.343	1.446	1.98%	3.62%	1.89%
Ukraine	3.079	1.969	1.677	1.764	1.845	1.886	1.888	1.863	-5.90%	0.96%	0.07%
Uzbekistan	1.702	1.614	1.890	2.278	2.623	2.887	3.092	3.393	1.05%	3.33%	1.73%
Other Eurasia	1.569	1.538	1.592	1.724	1.854	1.928	1.945	1.943	0.15%	1.53%	0.31%
Middle East	**9.825**	**13.379**	**14.477**	**15.517**	**17.077**	**18.361**	**19.524**	**20.590**	**3.95%**	**1.67%**	**1.26%**
Iran	3.707	5.106	5.243	5.491	5.930	6.310	6.609	6.921	3.53%	1.24%	1.04%
Qatar	0.660	0.796	1.102	1.142	1.229	1.285	1.313	1.324	5.26%	1.09%	0.50%
Oman	0.324	0.620	0.710	0.781	0.855	0.910	0.947	0.982	8.17%	1.88%	0.92%
Saudi Arabia	2.516	3.096	3.510	3.894	4.420	4.846	5.209	5.478	3.39%	2.33%	1.44%
United Arab Emirates	1.457	2.147	2.203	2.296	2.457	2.553	2.697	2.837	4.22%	1.10%	0.96%
Other Middle East	1.160	1.614	1.709	1.913	2.186	2.457	2.749	3.048	3.95%	2.49%	2.24%
Africa	**2.979**	**3.535**	**3.898**	**4.611**	**5.565**	**6.601**	**7.724**	**8.859**	**2.73%**	**3.62%**	**3.15%**
Algeria	0.846	1.024	1.087	1.229	1.427	1.594	1.711	1.786	2.53%	2.76%	1.51%
Egypt	1.208	1.630	1.795	2.031	2.354	2.741	3.275	3.819	4.04%	2.75%	3.28%
Nigeria	0.366	0.178	0.262	0.375	0.540	0.722	0.913	1.139	-3.29%	7.51%	5.10%
Other Africa	0.559	0.702	0.755	0.976	1.244	1.544	1.825	2.114	3.06%	5.13%	3.60%
Asia & Oceania	**13.741**	**20.677**	**24.169**	**31.088**	**36.255**	**40.926**	**44.708**	**45.330**	**5.81%**	**4.14%**	**1.50%**
Australia	1.014	1.249	1.546	1.819	1.920	2.002	2.075	2.120	4.31%	2.19%	0.66%
China	1.655	3.769	6.018	9.098	12.081	14.874	17.176	18.067	13.78%	7.22%	2.72%
India	1.269	2.277	1.959	2.804	3.373	3.981	4.574	4.719	4.44%	5.58%	2.26%
Indonesia	0.638	1.397	1.384	1.659	1.989	2.390	2.746	3.028	8.04%	3.70%	2.84%
Japan	3.110	3.861	4.233	4.452	4.275	4.096	4.043	3.794	3.13%	0.10%	-0.79%
Malaysia	0.914	1.145	1.084	1.308	1.444	1.536	1.560	1.461	1.72%	2.91%	0.08%
Myanmar	0.146	0.114	0.119	0.164	0.215	0.281	0.338	0.358	-2.03%	6.06%	3.47%
Pakistan	1.088	1.400	1.331	1.676	2.014	2.210	2.322	2.354	2.04%	4.22%	1.05%
Singapore	0.233	0.297	0.370	0.419	0.426	0.423	0.413	0.396	4.72%	1.41%	-0.49%
South Korea	1.076	1.524	1.965	2.429	2.596	2.694	2.713	2.595	6.20%	2.83%	0.00%
Thailand	1.150	1.592	1.838	2.184	2.350	2.426	2.505	2.287	4.80%	2.49%	-0.18%
Other Asia & Oceania	1.447	2.051	2.321	3.078	3.573	4.012	4.243	4.152	4.84%	4.41%	1.01%
World	**99.448**	**113.816**	**120.734**	**134.491**	**147.344**	**156.960**	**164.639**	**168.674**	**1.96%**	**2.01%**	**0.91%**

LNG20_Ref12 Case (Demand)(tcf)

	2005	2010	2015	2020	2025	2030	2035	2040	cagr 2005-15	cagr 2015-25	cagr 2025-40
North America	**26.814**	**29.188**	**32.709**	**34.699**	**36.694**	**37.271**	**38.133**	**39.053**	**2.01%**	**1.16%**	**0.42%**
Canada	3.144	2.815	3.128	3.365	3.516	3.580	3.644	3.700	-0.05%	1.17%	0.34%
Mexico	1.656	2.286	2.486	2.641	2.859	3.089	3.309	3.515	4.14%	1.41%	1.39%
United States	22.014	24.087	27.095	28.693	30.319	30.602	31.180	31.837	2.10%	1.13%	0.33%
Central & South America	**4.208**	**4.897**	**5.727**	**6.180**	**6.889**	**7.450**	**7.861**	**8.176**	**3.13%**	**1.86%**	**1.15%**
Argentina	1.428	1.529	1.612	1.863	2.036	2.175	2.288	2.388	1.22%	2.37%	1.07%
Brazil	0.657	0.890	1.157	1.349	1.557	1.745	1.885	2.006	5.82%	3.01%	1.70%
Chile	0.295	0.187	0.231	0.290	0.333	0.370	0.401	0.426	-2.40%	3.72%	1.66%
Colombia	0.236	0.321	0.393	0.402	0.448	0.490	0.524	0.561	5.25%	1.31%	1.52%
Peru	0.056	0.194	0.218	0.234	0.264	0.292	0.314	0.334	14.62%	1.91%	1.58%
Trinidad and Tobago	0.575	0.824	0.752	0.769	0.779	0.759	0.738	0.702	2.73%	0.36%	-0.69%
Venezuela	0.828	0.748	1.102	0.981	1.133	1.235	1.300	1.324	2.90%	0.28%	1.04%
Other Central & South America	0.135	0.205	0.262	0.293	0.339	0.383	0.411	0.435	6.91%	2.59%	1.68%
Europe	**20.095**	**20.525**	**17.964**	**18.592**	**19.110**	**19.234**	**19.285**	**19.045**	**-1.11%**	**0.62%**	**-0.02%**
Austria	0.354	0.353	0.286	0.293	0.305	0.311	0.315	0.314	-2.11%	0.66%	0.20%
Belgium	0.601	0.700	0.612	0.650	0.689	0.718	0.730	0.730	0.18%	1.19%	0.38%
France	1.740	1.695	1.421	1.414	1.390	1.330	1.294	1.245	-2.01%	-0.22%	-0.73%
Germany	3.203	3.329	3.057	3.089	3.138	3.149	3.090	2.986	-0.46%	0.26%	-0.33%
Italy	3.046	2.935	2.322	2.334	2.349	2.342	2.336	2.316	-2.68%	0.11%	-0.09%
Netherlands	1.741	1.937	1.717	1.739	1.734	1.683	1.636	1.576	-0.14%	0.10%	-0.63%
Norway	0.187	0.194	0.225	0.250	0.264	0.255	0.238	0.227	1.87%	1.61%	-1.00%
Poland	0.573	0.606	0.617	0.684	0.738	0.772	0.788	0.786	0.74%	1.80%	0.42%
Portugal	0.152	0.182	0.145	0.152	0.157	0.161	0.166	0.167	-0.46%	0.83%	0.40%
Romania	0.643	0.455	0.454	0.493	0.519	0.528	0.533	0.519	-3.42%	1.35%	0.00%
Spain	1.188	1.265	1.050	1.091	1.129	1.152	1.180	1.206	-1.23%	0.73%	0.44%
Turkey	0.967	1.346	1.526	1.675	1.786	1.865	1.967	2.051	4.67%	1.58%	0.93%
United Kingdom	3.376	3.337	2.644	2.716	2.783	2.785	2.811	2.751	-2.41%	0.51%	-0.08%
Other Europe	2.324	2.192	1.887	2.012	2.128	2.182	2.200	2.170	-2.06%	1.21%	0.13%
Eurasia	**21.786**	**21.616**	**21.674**	**22.922**	**24.204**	**24.860**	**25.172**	**25.366**	**-0.05%**	**1.11%**	**0.31%**
Kazakhstan	0.477	0.303	0.474	0.555	0.637	0.691	0.731	0.763	-0.05%	2.99%	1.21%
Russia	14.330	15.471	15.276	15.675	16.146	16.242	16.165	15.954	0.64%	0.56%	-0.08%
Turkmenistan	0.629	0.720	0.765	0.928	1.093	1.223	1.345	1.447	1.98%	3.63%	1.89%
Ukraine	3.079	1.969	1.677	1.763	1.847	1.887	1.891	1.864	-5.90%	0.97%	0.06%
Uzbekistan	1.702	1.614	1.890	2.277	2.625	2.888	3.095	3.394	1.06%	3.34%	1.73%
Other Eurasia	1.569	1.538	1.592	1.723	1.855	1.929	1.947	1.943	0.15%	1.54%	0.31%
Middle East	**9.825**	**13.379**	**14.477**	**15.516**	**17.078**	**18.357**	**19.547**	**20.591**	**3.95%**	**1.67%**	**1.25%**
Iran	3.707	5.106	5.243	5.490	5.930	6.304	6.618	6.919	3.53%	1.24%	1.03%
Qatar	0.660	0.796	1.102	1.143	1.229	1.285	1.314	1.326	5.26%	1.09%	0.51%
Oman	0.324	0.620	0.710	0.780	0.856	0.909	0.946	0.977	8.17%	1.88%	0.89%
Saudi Arabia	2.516	3.096	3.510	3.893	4.418	4.848	5.213	5.492	3.39%	2.33%	1.46%
United Arab Emirates	1.457	2.147	2.203	2.296	2.457	2.556	2.702	2.855	4.22%	1.10%	1.01%
Other Middle East	1.160	1.614	1.709	1.914	2.188	2.456	2.755	3.022	3.95%	2.50%	2.18%
Africa	**2.979**	**3.535**	**3.897**	**4.607**	**5.565**	**6.612**	**7.728**	**8.852**	**2.72%**	**3.63%**	**3.14%**
Algeria	0.846	1.024	1.087	1.230	1.427	1.597	1.716	1.785	2.53%	2.76%	1.50%
Egypt	1.208	1.630	1.795	2.030	2.358	2.745	3.272	3.817	4.04%	2.77%	3.26%
Nigeria	0.366	0.178	0.261	0.373	0.537	0.725	0.913	1.139	-3.32%	7.49%	5.13%
Other Africa	0.559	0.702	0.755	0.975	1.243	1.546	1.827	2.110	3.05%	5.11%	3.59%
Asia & Oceania	**13.741**	**20.677**	**24.170**	**31.068**	**36.223**	**40.888**	**44.212**	**44.544**	**5.81%**	**4.13%**	**1.39%**
Australia	1.014	1.249	1.546	1.819	1.919	2.002	2.076	2.115	4.30%	2.19%	0.65%
China	1.655	3.769	6.018	9.087	12.080	14.852	16.905	17.669	13.78%	7.22%	2.57%
India	1.269	2.277	1.959	2.804	3.365	3.978	4.504	4.640	4.43%	5.56%	2.17%
Indonesia	0.638	1.397	1.384	1.658	1.988	2.388	2.765	3.039	8.05%	3.69%	2.87%
Japan	3.110	3.861	4.235	4.450	4.273	4.093	3.996	3.725	3.13%	0.09%	-0.91%
Malaysia	0.914	1.145	1.084	1.307	1.443	1.535	1.558	1.421	1.72%	2.90%	-0.10%
Myanmar	0.146	0.114	0.119	0.164	0.214	0.283	0.336	0.355	-2.04%	6.04%	3.44%
Pakistan	1.088	1.400	1.331	1.673	2.008	2.210	2.269	2.258	2.04%	4.20%	0.79%
Singapore	0.233	0.297	0.370	0.418	0.426	0.423	0.413	0.388	4.72%	1.40%	-0.61%
South Korea	1.076	1.524	1.966	2.428	2.596	2.689	2.680	2.535	6.21%	2.82%	-0.16%
Thailand	1.150	1.592	1.838	2.184	2.349	2.425	2.501	2.279	4.80%	2.48%	-0.20%
Other Asia & Oceania	1.447	2.051	2.322	3.076	3.563	4.011	4.210	4.121	4.84%	4.38%	0.97%
World	**99.448**	**113.816**	**120.619**	**133.584**	**145.762**	**154.673**	**161.938**	**165.626**	**1.95%**	**1.91%**	**0.86%**

LNG20_HRR12 Case (Demand)(tcf)

	2005	2010	2015	2020	2025	2030	2035	2040	cagr 2005-15	cagr 2015-25	cagr 2025-40
North America	**26.814**	**29.188**	**32.859**	**35.068**	**37.115**	**37.953**	**38.932**	**39.948**	**2.05%**	**1.23%**	**0.49%**
Canada	3.144	2.815	3.124	3.326	3.487	3.596	3.667	3.731	-0.06%	1.10%	0.45%
Mexico	1.656	2.286	2.496	2.648	2.851	3.057	3.267	3.443	4.18%	1.34%	1.27%
United States	22.014	24.087	27.239	29.094	30.777	31.301	31.998	32.774	2.15%	1.23%	0.42%
Central & South America	**4.208**	**4.897**	**5.729**	**6.180**	**6.884**	**7.450**	**7.852**	**8.163**	**3.13%**	**1.85%**	**1.14%**
Argentina	1.428	1.529	1.612	1.863	2.036	2.174	2.287	2.385	1.22%	2.36%	1.06%
Brazil	0.657	0.890	1.157	1.349	1.556	1.744	1.885	2.005	5.82%	3.01%	1.70%
Chile	0.295	0.187	0.231	0.290	0.333	0.370	0.401	0.426	-2.40%	3.72%	1.66%
Colombia	0.236	0.321	0.393	0.402	0.446	0.491	0.521	0.559	5.25%	1.28%	1.51%
Peru	0.056	0.194	0.220	0.234	0.264	0.292	0.314	0.333	14.70%	1.84%	1.55%
Trinidad and Tobago	0.575	0.824	0.752	0.769	0.775	0.760	0.738	0.706	2.73%	0.31%	-0.62%
Venezuela	0.828	0.748	1.102	0.981	1.134	1.236	1.295	1.314	2.90%	0.29%	0.99%
Other Central & South America	0.135	0.205	0.263	0.293	0.339	0.383	0.412	0.435	6.93%	2.59%	1.66%
Europe	**20.095**	**20.525**	**17.964**	**18.591**	**19.096**	**19.214**	**19.272**	**19.080**	**-1.11%**	**0.61%**	**-0.01%**
Austria	0.354	0.353	0.286	0.293	0.305	0.311	0.315	0.315	-2.11%	0.65%	0.21%
Belgium	0.601	0.700	0.612	0.650	0.689	0.717	0.729	0.730	0.18%	1.19%	0.39%
France	1.740	1.695	1.421	1.413	1.388	1.327	1.293	1.248	-2.01%	-0.23%	-0.71%
Germany	3.203	3.329	3.057	3.089	3.135	3.145	3.088	2.992	-0.46%	0.25%	-0.31%
Italy	3.046	2.935	2.322	2.334	2.348	2.340	2.336	2.318	-2.68%	0.11%	-0.09%
Netherlands	1.741	1.937	1.717	1.740	1.733	1.682	1.636	1.576	-0.14%	0.09%	-0.63%
Norway	0.187	0.194	0.225	0.250	0.264	0.255	0.238	0.228	1.86%	1.62%	-0.99%
Poland	0.573	0.606	0.617	0.684	0.738	0.772	0.787	0.788	0.74%	1.80%	0.44%
Portugal	0.152	0.182	0.145	0.152	0.157	0.161	0.166	0.167	-0.46%	0.82%	0.41%
Romania	0.643	0.455	0.454	0.492	0.519	0.528	0.533	0.519	-3.42%	1.35%	0.00%
Spain	1.188	1.265	1.050	1.091	1.128	1.151	1.180	1.208	-1.23%	0.72%	0.46%
Turkey	0.967	1.346	1.527	1.675	1.785	1.864	1.965	2.060	4.68%	1.57%	0.96%
United Kingdom	3.376	3.337	2.645	2.716	2.780	2.782	2.809	2.754	-2.41%	0.50%	-0.06%
Other Europe	2.324	2.192	1.887	2.011	2.126	2.179	2.197	2.176	-2.06%	1.20%	0.16%
Eurasia	**21.786**	**21.616**	**21.673**	**22.918**	**24.204**	**24.849**	**25.163**	**25.411**	**-0.05%**	**1.11%**	**0.32%**
Kazakhstan	0.477	0.303	0.474	0.555	0.637	0.691	0.730	0.762	-0.05%	3.00%	1.20%
Russia	14.330	15.471	15.275	15.673	16.147	16.229	16.158	15.993	0.64%	0.56%	-0.06%
Turkmenistan	0.629	0.720	0.765	0.928	1.093	1.226	1.345	1.446	1.98%	3.63%	1.89%
Ukraine	3.079	1.969	1.677	1.764	1.846	1.887	1.888	1.865	-5.90%	0.97%	0.07%
Uzbekistan	1.702	1.614	1.890	2.276	2.625	2.888	3.095	3.399	1.05%	3.34%	1.74%
Other Eurasia	1.569	1.538	1.592	1.723	1.855	1.928	1.946	1.945	0.15%	1.54%	0.32%
Middle East	**9.825**	**13.379**	**14.480**	**15.510**	**17.078**	**18.356**	**19.487**	**20.625**	**3.96%**	**1.66%**	**1.27%**
Iran	3.707	5.106	5.244	5.485	5.924	6.301	6.579	6.967	3.53%	1.23%	1.09%
Qatar	0.660	0.796	1.102	1.143	1.228	1.286	1.310	1.332	5.26%	1.09%	0.54%
Oman	0.324	0.620	0.710	0.780	0.858	0.908	0.943	0.976	8.17%	1.91%	0.86%
Saudi Arabia	2.516	3.096	3.511	3.893	4.423	4.850	5.200	5.473	3.39%	2.34%	1.43%
United Arab Emirates	1.457	2.147	2.203	2.296	2.457	2.555	2.709	2.832	4.22%	1.10%	0.95%
Other Middle East	1.160	1.614	1.710	1.913	2.186	2.456	2.746	3.046	3.95%	2.49%	2.23%
Africa	**2.979**	**3.535**	**3.897**	**4.607**	**5.562**	**6.606**	**7.745**	**8.868**	**2.72%**	**3.62%**	**3.16%**
Algeria	0.846	1.024	1.087	1.229	1.426	1.592	1.716	1.788	2.53%	2.76%	1.52%
Egypt	1.208	1.630	1.795	2.030	2.357	2.742	3.270	3.818	4.04%	2.76%	3.27%
Nigeria	0.366	0.178	0.261	0.373	0.536	0.725	0.924	1.140	-3.32%	7.46%	5.15%
Other Africa	0.559	0.702	0.755	0.975	1.242	1.546	1.834	2.122	3.05%	5.11%	3.64%
Asia & Oceania	**13.741**	**20.677**	**24.167**	**31.065**	**36.256**	**40.863**	**44.207**	**44.544**	**5.81%**	**4.14%**	**1.38%**
Australia	1.014	1.249	1.545	1.819	1.918	2.003	2.076	2.114	4.30%	2.19%	0.65%
China	1.655	3.769	6.016	9.089	12.101	14.842	16.894	17.667	13.78%	7.24%	2.55%
India	1.269	2.277	1.959	2.803	3.368	3.975	4.504	4.640	4.43%	5.57%	2.16%
Indonesia	0.638	1.397	1.384	1.658	1.989	2.387	2.767	3.039	8.04%	3.69%	2.87%
Japan	3.110	3.861	4.234	4.449	4.279	4.091	3.995	3.724	3.13%	0.11%	-0.92%
Malaysia	0.914	1.145	1.084	1.308	1.443	1.534	1.559	1.423	1.72%	2.90%	-0.09%
Myanmar	0.146	0.114	0.119	0.164	0.214	0.283	0.336	0.355	-2.04%	6.02%	3.45%
Pakistan	1.088	1.400	1.331	1.672	2.006	2.205	2.269	2.259	2.04%	4.19%	0.79%
Singapore	0.233	0.297	0.370	0.418	0.426	0.423	0.413	0.388	4.72%	1.40%	-0.61%
South Korea	1.076	1.524	1.965	2.427	2.601	2.689	2.680	2.535	6.21%	2.84%	-0.17%
Thailand	1.150	1.592	1.838	2.184	2.349	2.423	2.503	2.278	4.80%	2.48%	-0.20%
Other Asia & Oceania	1.447	2.051	2.322	3.074	3.564	4.009	4.213	4.121	4.84%	4.38%	0.97%
World	**99.448**	**113.816**	**120.771**	**133.940**	**146.194**	**155.291**	**162.658**	**166.638**	**1.96%**	**1.93%**	**0.88%**

LNG20_LRR12 Case (Demand)(tcf)

	2005	2010	2015	2020	2025	2030	2035	2040	cagr 2005-15	cagr 2015-25	cagr 2025-40
North America	**26.814**	**29.188**	**32.515**	**34.438**	**36.283**	**36.655**	**37.338**	**38.064**	**1.95%**	**1.10%**	**0.32%**
Canada	3.144	2.815	3.131	3.390	3.510	3.565	3.616	3.665	-0.04%	1.15%	0.29%
Mexico	1.656	2.286	2.478	2.636	2.884	3.129	3.361	3.511	4.11%	1.53%	1.32%
United States	22.014	24.087	26.906	28.412	29.889	29.961	30.360	30.887	2.03%	1.06%	0.22%
Central & South America	**4.208**	**4.897**	**5.729**	**6.177**	**6.884**	**7.449**	**7.849**	**8.178**	**3.13%**	**1.85%**	**1.16%**
Argentina	1.428	1.529	1.612	1.862	2.036	2.175	2.288	2.385	1.22%	2.37%	1.06%
Brazil	0.657	0.890	1.157	1.349	1.556	1.746	1.886	2.005	5.82%	3.01%	1.70%
Chile	0.295	0.187	0.231	0.290	0.333	0.370	0.401	0.426	-2.39%	3.71%	1.65%
Colombia	0.236	0.321	0.393	0.403	0.447	0.489	0.522	0.560	5.25%	1.30%	1.52%
Peru	0.056	0.194	0.220	0.233	0.264	0.292	0.311	0.332	14.70%	1.85%	1.53%
Trinidad and Tobago	0.575	0.824	0.752	0.768	0.775	0.758	0.737	0.703	2.73%	0.31%	-0.65%
Venezuela	0.828	0.748	1.102	0.980	1.133	1.234	1.292	1.336	2.90%	0.28%	1.11%
Other Central & South America	0.135	0.205	0.263	0.293	0.339	0.384	0.411	0.432	6.93%	2.58%	1.62%
Europe	**20.095**	**20.525**	**17.965**	**18.581**	**19.102**	**19.209**	**19.290**	**19.044**	**-1.11%**	**0.62%**	**-0.02%**
Austria	0.354	0.353	0.286	0.293	0.305	0.311	0.315	0.314	-2.11%	0.66%	0.20%
Belgium	0.601	0.700	0.612	0.650	0.689	0.717	0.730	0.729	0.18%	1.19%	0.38%
France	1.740	1.695	1.421	1.411	1.389	1.326	1.296	1.244	-2.01%	-0.22%	-0.73%
Germany	3.203	3.329	3.057	3.087	3.136	3.145	3.090	2.988	-0.46%	0.26%	-0.32%
Italy	3.046	2.935	2.322	2.332	2.349	2.339	2.336	2.317	-2.68%	0.11%	-0.09%
Netherlands	1.741	1.937	1.717	1.740	1.733	1.681	1.636	1.576	-0.14%	0.09%	-0.63%
Norway	0.187	0.194	0.225	0.249	0.264	0.253	0.241	0.226	1.84%	1.62%	-1.04%
Poland	0.573	0.606	0.617	0.684	0.737	0.772	0.787	0.787	0.74%	1.79%	0.43%
Portugal	0.152	0.182	0.145	0.152	0.157	0.161	0.166	0.167	-0.46%	0.82%	0.40%
Romania	0.643	0.455	0.454	0.492	0.519	0.528	0.533	0.519	-3.42%	1.35%	0.00%
Spain	1.188	1.265	1.050	1.091	1.128	1.150	1.180	1.207	-1.23%	0.72%	0.45%
Turkey	0.967	1.346	1.527	1.674	1.786	1.864	1.967	2.058	4.67%	1.58%	0.95%
United Kingdom	3.376	3.337	2.645	2.716	2.781	2.782	2.813	2.740	-2.41%	0.50%	-0.10%
Other Europe	2.324	2.192	1.887	2.010	2.127	2.179	2.200	2.172	-2.06%	1.20%	0.14%
Eurasia	**21.786**	**21.616**	**21.675**	**22.917**	**24.196**	**24.852**	**25.164**	**25.380**	**-0.05%**	**1.11%**	**0.32%**
Kazakhstan	0.477	0.303	0.474	0.555	0.637	0.691	0.730	0.764	-0.05%	3.00%	1.22%
Russia	14.330	15.471	15.276	15.672	16.139	16.235	16.161	15.962	0.64%	0.55%	-0.07%
Turkmenistan	0.629	0.720	0.766	0.928	1.094	1.224	1.342	1.447	1.99%	3.64%	1.88%
Ukraine	3.079	1.969	1.677	1.763	1.847	1.886	1.890	1.864	-5.90%	0.97%	0.06%
Uzbekistan	1.702	1.614	1.890	2.276	2.624	2.888	3.094	3.398	1.06%	3.33%	1.74%
Other Eurasia	1.569	1.538	1.592	1.723	1.856	1.928	1.946	1.944	0.15%	1.54%	0.31%
Middle East	**9.825**	**13.379**	**14.479**	**15.514**	**17.073**	**18.360**	**19.522**	**20.633**	**3.95%**	**1.66%**	**1.27%**
Iran	3.707	5.106	5.244	5.488	5.925	6.308	6.579	6.950	3.53%	1.23%	1.07%
Qatar	0.660	0.796	1.102	1.142	1.229	1.287	1.316	1.328	5.26%	1.09%	0.52%
Oman	0.324	0.620	0.710	0.781	0.859	0.908	0.945	0.975	8.17%	1.92%	0.85%
Saudi Arabia	2.516	3.096	3.510	3.894	4.417	4.846	5.213	5.494	3.38%	2.33%	1.47%
United Arab Emirates	1.457	2.147	2.203	2.297	2.456	2.553	2.707	2.845	4.22%	1.09%	0.99%
Other Middle East	1.160	1.614	1.710	1.912	2.188	2.459	2.762	3.041	3.96%	2.49%	2.22%
Africa	**2.979**	**3.535**	**3.898**	**4.608**	**5.566**	**6.606**	**7.743**	**8.842**	**2.73%**	**3.62%**	**3.13%**
Algeria	0.846	1.024	1.087	1.230	1.428	1.594	1.717	1.785	2.53%	2.77%	1.50%
Egypt	1.208	1.630	1.795	2.028	2.357	2.742	3.277	3.814	4.04%	2.76%	3.26%
Nigeria	0.366	0.178	0.262	0.375	0.537	0.724	0.921	1.139	-3.29%	7.45%	5.14%
Other Africa	0.559	0.702	0.755	0.975	1.243	1.546	1.828	2.104	3.05%	5.12%	3.57%
Asia & Oceania	**13.741**	**20.677**	**24.171**	**31.034**	**36.202**	**40.784**	**44.220**	**44.534**	**5.81%**	**4.12%**	**1.39%**
Australia	1.014	1.249	1.545	1.820	1.920	2.002	2.078	2.125	4.30%	2.20%	0.68%
China	1.655	3.769	6.018	9.070	12.064	14.820	16.894	17.666	13.78%	7.20%	2.58%
India	1.269	2.277	1.959	2.802	3.360	3.952	4.508	4.643	4.43%	5.55%	2.18%
Indonesia	0.638	1.397	1.384	1.658	1.989	2.388	2.764	3.033	8.05%	3.69%	2.85%
Japan	3.110	3.861	4.235	4.442	4.271	4.067	3.998	3.726	3.14%	0.08%	-0.91%
Malaysia	0.914	1.145	1.083	1.308	1.444	1.533	1.558	1.409	1.72%	2.91%	-0.17%
Myanmar	0.146	0.114	0.119	0.164	0.214	0.283	0.336	0.354	-2.04%	6.03%	3.42%
Pakistan	1.088	1.400	1.331	1.673	2.007	2.208	2.273	2.259	2.04%	4.19%	0.79%
Singapore	0.233	0.297	0.370	0.419	0.426	0.423	0.413	0.385	4.72%	1.40%	-0.67%
South Korea	1.076	1.524	1.966	2.422	2.593	2.682	2.681	2.536	6.21%	2.81%	-0.15%
Thailand	1.150	1.592	1.838	2.184	2.349	2.422	2.502	2.277	4.80%	2.48%	-0.21%
Other Asia & Oceania	1.447	2.051	2.322	3.073	3.565	4.004	4.215	4.122	4.84%	4.38%	0.97%
World	**99.448**	**113.816**	**120.432**	**133.269**	**145.305**	**153.915**	**161.126**	**164.675**	**1.93%**	**1.90%**	**0.84%**

LNG20_Hi-D12 Case (Demand)(tcf)

	2005	2010	2015	2020	2025	2030	2035	2040	cagr 2005-15	cagr 2015-25	cagr 2025-40
North America	**26.814**	**29.188**	**32.842**	**35.601**	**38.311**	**39.581**	**40.421**	**41.271**	**2.05%**	**1.55%**	**0.50%**
Canada	3.144	2.815	3.131	3.378	3.511	3.574	3.637	3.689	-0.04%	1.15%	0.33%
Mexico	1.656	2.286	2.484	2.635	2.866	3.099	3.332	3.521	4.14%	1.44%	1.38%
United States	22.014	24.087	27.227	29.588	31.934	32.909	33.452	34.061	2.15%	1.61%	0.43%
Central & South America	**4.208**	**4.897**	**5.728**	**6.179**	**6.883**	**7.452**	**7.834**	**8.198**	**3.13%**	**1.85%**	**1.17%**
Argentina	1.428	1.529	1.612	1.863	2.036	2.175	2.287	2.384	1.22%	2.36%	1.06%
Brazil	0.657	0.890	1.157	1.349	1.556	1.746	1.886	2.005	5.82%	3.01%	1.70%
Chile	0.295	0.187	0.231	0.290	0.333	0.370	0.401	0.426	-2.40%	3.72%	1.65%
Colombia	0.236	0.321	0.393	0.402	0.446	0.491	0.518	0.558	5.25%	1.28%	1.50%
Peru	0.056	0.194	0.219	0.234	0.264	0.291	0.313	0.333	14.64%	1.89%	1.56%
Trinidad and Tobago	0.575	0.824	0.752	0.769	0.775	0.759	0.736	0.709	2.72%	0.31%	-0.59%
Venezuela	0.828	0.748	1.102	0.979	1.133	1.236	1.284	1.352	2.90%	0.28%	1.18%
Other Central & South America	0.135	0.205	0.263	0.292	0.339	0.384	0.409	0.433	6.92%	2.59%	1.64%
Europe	**20.095**	**20.525**	**17.964**	**18.600**	**19.091**	**19.208**	**19.276**	**19.054**	**-1.11%**	**0.61%**	**-0.01%**
Austria	0.354	0.353	0.286	0.294	0.305	0.311	0.315	0.314	-2.11%	0.65%	0.21%
Belgium	0.601	0.700	0.612	0.651	0.688	0.717	0.729	0.730	0.18%	1.18%	0.39%
France	1.740	1.695	1.421	1.415	1.388	1.326	1.294	1.245	-2.01%	-0.24%	-0.72%
Germany	3.203	3.329	3.057	3.091	3.134	3.144	3.088	2.988	-0.46%	0.25%	-0.32%
Italy	3.046	2.935	2.322	2.334	2.348	2.340	2.336	2.316	-2.68%	0.11%	-0.09%
Netherlands	1.741	1.937	1.717	1.741	1.733	1.681	1.635	1.577	-0.14%	0.09%	-0.63%
Norway	0.187	0.194	0.225	0.250	0.264	0.255	0.238	0.226	1.86%	1.62%	-1.03%
Poland	0.573	0.606	0.617	0.684	0.737	0.771	0.786	0.786	0.74%	1.79%	0.43%
Portugal	0.152	0.182	0.145	0.152	0.157	0.161	0.166	0.167	-0.46%	0.82%	0.41%
Romania	0.643	0.455	0.454	0.493	0.519	0.528	0.533	0.519	-3.42%	1.34%	0.01%
Spain	1.188	1.265	1.050	1.092	1.127	1.151	1.180	1.206	-1.23%	0.72%	0.45%
Turkey	0.967	1.346	1.527	1.676	1.786	1.864	1.966	2.057	4.67%	1.58%	0.95%
United Kingdom	3.376	3.337	2.644	2.717	2.779	2.782	2.812	2.749	-2.41%	0.50%	-0.07%
Other Europe	2.324	2.192	1.887	2.013	2.125	2.178	2.198	2.173	-2.06%	1.20%	0.15%
Eurasia	**21.786**	**21.616**	**21.673**	**22.921**	**24.195**	**24.843**	**25.162**	**25.383**	**-0.05%**	**1.11%**	**0.32%**
Kazakhstan	0.477	0.303	0.474	0.555	0.638	0.691	0.730	0.763	-0.05%	3.00%	1.20%
Russia	14.330	15.471	15.275	15.674	16.140	16.227	16.157	15.967	0.64%	0.55%	-0.07%
Turkmenistan	0.629	0.720	0.765	0.927	1.092	1.225	1.346	1.448	1.98%	3.63%	1.90%
Ukraine	3.079	1.969	1.677	1.764	1.846	1.886	1.888	1.865	-5.90%	0.96%	0.07%
Uzbekistan	1.702	1.614	1.890	2.277	2.624	2.887	3.095	3.396	1.05%	3.34%	1.73%
Other Eurasia	1.569	1.538	1.592	1.724	1.855	1.927	1.946	1.944	0.15%	1.54%	0.31%
Middle East	**9.825**	**13.379**	**14.481**	**15.516**	**17.084**	**18.363**	**19.530**	**20.592**	**3.96%**	**1.67%**	**1.25%**
Iran	3.707	5.106	5.244	5.490	5.931	6.302	6.598	6.936	3.53%	1.24%	1.05%
Qatar	0.660	0.796	1.102	1.142	1.229	1.287	1.315	1.329	5.26%	1.09%	0.52%
Oman	0.324	0.620	0.710	0.781	0.856	0.910	0.947	0.973	8.17%	1.88%	0.86%
Saudi Arabia	2.516	3.096	3.511	3.892	4.422	4.853	5.211	5.479	3.39%	2.33%	1.44%
United Arab Emirates	1.457	2.147	2.203	2.297	2.457	2.554	2.704	2.840	4.22%	1.10%	0.97%
Other Middle East	1.160	1.614	1.711	1.913	2.190	2.457	2.755	3.035	3.96%	2.50%	2.20%
Africa	**2.979**	**3.535**	**3.898**	**4.611**	**5.565**	**6.603**	**7.735**	**8.845**	**2.73%**	**3.62%**	**3.14%**
Algeria	0.846	1.024	1.087	1.230	1.427	1.595	1.715	1.784	2.53%	2.76%	1.50%
Egypt	1.208	1.630	1.795	2.030	2.355	2.742	3.273	3.808	4.04%	2.75%	3.26%
Nigeria	0.366	0.178	0.262	0.376	0.540	0.722	0.918	1.143	-3.29%	7.50%	5.12%
Other Africa	0.559	0.702	0.755	0.975	1.244	1.544	1.829	2.110	3.05%	5.12%	3.59%
Asia & Oceania	**13.741**	**20.677**	**24.170**	**31.073**	**36.216**	**40.844**	**44.221**	**44.541**	**5.81%**	**4.13%**	**1.39%**
Australia	1.014	1.249	1.546	1.819	1.920	2.002	2.078	2.122	4.30%	2.19%	0.67%
China	1.655	3.769	6.017	9.091	12.071	14.836	16.905	17.672	13.78%	7.21%	2.57%
India	1.269	2.277	1.959	2.803	3.363	3.967	4.506	4.642	4.43%	5.56%	2.17%
Indonesia	0.638	1.397	1.384	1.658	1.989	2.387	2.765	3.036	8.04%	3.69%	2.86%
Japan	3.110	3.861	4.235	4.451	4.272	4.082	3.997	3.726	3.14%	0.09%	-0.91%
Malaysia	0.914	1.145	1.084	1.310	1.445	1.534	1.558	1.410	1.72%	2.92%	-0.16%
Myanmar	0.146	0.114	0.119	0.164	0.214	0.283	0.335	0.355	-2.04%	6.03%	3.44%
Pakistan	1.088	1.400	1.331	1.673	2.008	2.212	2.271	2.259	2.04%	4.20%	0.79%
Singapore	0.233	0.297	0.370	0.419	0.426	0.423	0.413	0.385	4.72%	1.41%	-0.66%
South Korea	1.076	1.524	1.966	2.429	2.595	2.686	2.681	2.536	6.21%	2.81%	-0.15%
Thailand	1.150	1.592	1.838	2.184	2.349	2.424	2.502	2.277	4.80%	2.48%	-0.21%
Other Asia & Oceania	1.447	2.051	2.322	3.075	3.566	4.008	4.210	4.120	4.84%	4.38%	0.97%
World	**99.448**	**113.816**	**120.757**	**134.502**	**147.345**	**156.895**	**164.179**	**167.884**	**1.96%**	**2.01%**	**0.87%**

LNG20_Ref20 Case (Demand)(tcf)

	2005	2010	2015	2020	2025	2030	2035	2040	cagr 2005-15	cagr 2015-25	cagr 2025-40
North America	**26.814**	**29.188**	**32.703**	**34.687**	**36.651**	**37.249**	**38.132**	**39.020**	**2.00%**	**1.15%**	**0.42%**
Canada	3.144	2.815	3.129	3.368	3.516	3.579	3.641	3.698	-0.05%	1.17%	0.34%
Mexico	1.656	2.286	2.485	2.638	2.861	3.099	3.335	3.519	4.14%	1.42%	1.39%
United States	22.014	24.087	27.088	28.681	30.275	30.570	31.155	31.804	2.10%	1.12%	0.33%
Central & South America	**4.208**	**4.897**	**5.728**	**6.181**	**6.885**	**7.446**	**7.844**	**8.188**	**3.13%**	**1.86%**	**1.16%**
Argentina	1.428	1.529	1.612	1.863	2.035	2.173	2.286	2.387	1.22%	2.36%	1.07%
Brazil	0.657	0.890	1.157	1.349	1.556	1.744	1.884	2.007	5.82%	3.01%	1.71%
Chile	0.295	0.187	0.231	0.290	0.333	0.370	0.401	0.426	-2.40%	3.71%	1.66%
Colombia	0.236	0.321	0.393	0.402	0.446	0.490	0.523	0.562	5.25%	1.28%	1.56%
Peru	0.056	0.194	0.219	0.234	0.264	0.291	0.314	0.333	14.68%	1.86%	1.55%
Trinidad and Tobago	0.575	0.824	0.752	0.769	0.780	0.758	0.739	0.707	2.72%	0.37%	-0.66%
Venezuela	0.828	0.748	1.102	0.981	1.132	1.236	1.291	1.337	2.90%	0.27%	1.12%
Other Central & South America	0.135	0.205	0.262	0.292	0.340	0.385	0.407	0.430	6.91%	2.61%	1.59%
Europe	**20.095**	**20.525**	**17.965**	**18.599**	**19.094**	**19.229**	**19.270**	**19.088**	**-1.11%**	**0.61%**	**0.00%**
Austria	0.354	0.353	0.286	0.293	0.305	0.311	0.315	0.315	-2.11%	0.65%	0.21%
Belgium	0.601	0.700	0.612	0.651	0.689	0.717	0.729	0.731	0.18%	1.18%	0.40%
France	1.740	1.695	1.421	1.415	1.388	1.329	1.293	1.251	-2.01%	-0.23%	-0.69%
Germany	3.203	3.329	3.057	3.091	3.135	3.148	3.087	2.991	-0.46%	0.25%	-0.31%
Italy	3.046	2.935	2.322	2.334	2.348	2.342	2.335	2.318	-2.68%	0.11%	-0.08%
Netherlands	1.741	1.937	1.717	1.741	1.733	1.682	1.635	1.579	-0.14%	0.09%	-0.62%
Norway	0.187	0.194	0.225	0.249	0.264	0.255	0.238	0.224	1.84%	1.63%	-1.09%
Poland	0.573	0.606	0.617	0.684	0.737	0.772	0.786	0.788	0.74%	1.79%	0.44%
Portugal	0.152	0.182	0.145	0.152	0.157	0.161	0.166	0.167	-0.46%	0.82%	0.41%
Romania	0.643	0.455	0.454	0.492	0.519	0.528	0.533	0.519	-3.42%	1.35%	0.01%
Spain	1.188	1.265	1.050	1.092	1.128	1.152	1.179	1.208	-1.23%	0.72%	0.46%
Turkey	0.967	1.346	1.526	1.676	1.784	1.865	1.966	2.056	4.67%	1.58%	0.95%
United Kingdom	3.376	3.337	2.645	2.717	2.781	2.784	2.810	2.767	-2.41%	0.50%	-0.03%
Other Europe	2.324	2.192	1.887	2.013	2.126	2.181	2.197	2.176	-2.06%	1.20%	0.15%
Eurasia	**21.786**	**21.616**	**21.675**	**22.924**	**24.192**	**24.857**	**25.156**	**25.384**	**-0.05%**	**1.10%**	**0.32%**
Kazakhstan	0.477	0.303	0.474	0.555	0.637	0.691	0.730	0.764	-0.05%	2.99%	1.22%
Russia	14.330	15.471	15.275	15.677	16.139	16.237	16.155	15.965	0.64%	0.55%	-0.07%
Turkmenistan	0.629	0.720	0.766	0.929	1.094	1.225	1.340	1.446	1.99%	3.63%	1.88%
Ukraine	3.079	1.969	1.677	1.764	1.846	1.886	1.890	1.866	-5.90%	0.96%	0.07%
Uzbekistan	1.702	1.614	1.890	2.276	2.623	2.890	3.093	3.398	1.06%	3.33%	1.74%
Other Eurasia	1.569	1.538	1.592	1.723	1.854	1.929	1.948	1.944	0.15%	1.53%	0.32%
Middle East	**9.825**	**13.379**	**14.478**	**15.511**	**17.073**	**18.348**	**19.491**	**20.626**	**3.95%**	**1.66%**	**1.27%**
Iran	3.707	5.106	5.243	5.486	5.923	6.302	6.589	6.952	3.53%	1.23%	1.07%
Qatar	0.660	0.796	1.103	1.143	1.229	1.286	1.313	1.332	5.26%	1.09%	0.54%
Oman	0.324	0.620	0.710	0.780	0.858	0.907	0.941	0.989	8.17%	1.91%	0.95%
Saudi Arabia	2.516	3.096	3.510	3.893	4.419	4.846	5.198	5.460	3.39%	2.33%	1.42%
United Arab Emirates	1.457	2.147	2.202	2.295	2.457	2.550	2.696	2.855	4.22%	1.10%	1.00%
Other Middle East	1.160	1.614	1.709	1.913	2.187	2.456	2.754	3.038	3.95%	2.49%	2.21%
Africa	**2.979**	**3.535**	**3.897**	**4.609**	**5.567**	**6.602**	**7.726**	**8.861**	**2.72%**	**3.63%**	**3.15%**
Algeria	0.846	1.024	1.087	1.229	1.426	1.595	1.711	1.788	2.53%	2.76%	1.52%
Egypt	1.208	1.630	1.795	2.031	2.357	2.744	3.274	3.820	4.04%	2.76%	3.27%
Nigeria	0.366	0.178	0.261	0.373	0.541	0.719	0.915	1.138	-3.32%	7.57%	5.08%
Other Africa	0.559	0.702	0.755	0.975	1.242	1.544	1.825	2.115	3.05%	5.11%	3.61%
Asia & Oceania	**13.741**	**20.677**	**24.172**	**31.083**	**36.276**	**40.944**	**44.760**	**45.208**	**5.81%**	**4.14%**	**1.48%**
Australia	1.014	1.249	1.546	1.818	1.921	2.003	2.081	2.121	4.31%	2.19%	0.66%
China	1.655	3.769	6.019	9.096	12.088	14.885	17.195	18.000	13.78%	7.22%	2.69%
India	1.269	2.277	1.959	2.803	3.372	3.990	4.578	4.700	4.44%	5.58%	2.24%
Indonesia	0.638	1.397	1.384	1.658	1.989	2.388	2.746	3.033	8.04%	3.69%	2.85%
Japan	3.110	3.861	4.234	4.452	4.276	4.103	4.047	3.785	3.13%	0.10%	-0.81%
Malaysia	0.914	1.145	1.084	1.309	1.446	1.535	1.561	1.455	1.72%	2.92%	0.04%
Myanmar	0.146	0.114	0.119	0.164	0.215	0.280	0.337	0.359	-2.03%	6.07%	3.49%
Pakistan	1.088	1.400	1.331	1.675	2.022	2.205	2.326	2.343	2.04%	4.27%	0.99%
Singapore	0.233	0.297	0.370	0.419	0.426	0.423	0.413	0.395	4.72%	1.41%	-0.49%
South Korea	1.076	1.524	1.965	2.429	2.597	2.697	2.715	2.587	6.21%	2.83%	-0.03%
Thailand	1.150	1.592	1.838	2.184	2.351	2.424	2.508	2.286	4.80%	2.49%	-0.19%
Other Asia & Oceania	1.447	2.051	2.322	3.077	3.573	4.013	4.253	4.145	4.84%	4.41%	0.99%
World	**99.448**	**113.816**	**120.616**	**133.593**	**145.739**	**154.675**	**162.379**	**166.376**	**1.95%**	**1.91%**	**0.89%**

LNG20_HRR20 Case (Demand)(tcf)

	2005	2010	2015	2020	2025	2030	2035	2040	cagr 2005-15	cagr 2015-25	cagr 2025-40
North America	**26.814**	**29.188**	**32.840**	**35.079**	**37.078**	**37.913**	**38.945**	**39.945**	**2.05%**	**1.22%**	**0.50%**
Canada	3.144	2.815	3.124	3.332	3.491	3.596	3.668	3.728	-0.06%	1.12%	0.44%
Mexico	1.656	2.286	2.494	2.654	2.849	3.063	3.275	3.471	4.18%	1.34%	1.32%
United States	22.014	24.087	27.221	29.092	30.738	31.254	32.002	32.746	2.15%	1.22%	0.42%
Central & South America	**4.208**	**4.897**	**5.727**	**6.181**	**6.887**	**7.452**	**7.856**	**8.219**	**3.13%**	**1.86%**	**1.19%**
Argentina	1.428	1.529	1.612	1.863	2.036	2.174	2.288	2.385	1.22%	2.37%	1.06%
Brazil	0.657	0.890	1.157	1.349	1.556	1.745	1.886	2.005	5.82%	3.01%	1.70%
Chile	0.295	0.187	0.231	0.290	0.333	0.370	0.401	0.426	-2.40%	3.72%	1.65%
Colombia	0.236	0.321	0.393	0.403	0.446	0.491	0.524	0.565	5.25%	1.27%	1.59%
Peru	0.056	0.194	0.218	0.234	0.264	0.291	0.315	0.332	14.61%	1.92%	1.55%
Trinidad and Tobago	0.575	0.824	0.752	0.769	0.778	0.758	0.738	0.707	2.73%	0.34%	-0.64%
Venezuela	0.828	0.748	1.102	0.981	1.133	1.236	1.297	1.368	2.90%	0.28%	1.26%
Other Central & South America	0.135	0.205	0.262	0.293	0.341	0.387	0.408	0.432	6.91%	2.64%	1.59%
Europe	**20.095**	**20.525**	**17.965**	**18.593**	**19.112**	**19.217**	**19.280**	**19.051**	**-1.11%**	**0.62%**	**-0.02%**
Austria	0.354	0.353	0.286	0.294	0.305	0.311	0.315	0.314	-2.11%	0.66%	0.20%
Belgium	0.601	0.700	0.612	0.650	0.689	0.717	0.730	0.730	0.18%	1.19%	0.38%
France	1.740	1.695	1.421	1.414	1.391	1.327	1.294	1.245	-2.01%	-0.21%	-0.74%
Germany	3.203	3.329	3.057	3.089	3.138	3.146	3.089	2.988	-0.46%	0.26%	-0.33%
Italy	3.046	2.935	2.322	2.334	2.349	2.341	2.335	2.316	-2.68%	0.12%	-0.09%
Netherlands	1.741	1.937	1.717	1.740	1.734	1.682	1.636	1.576	-0.14%	0.10%	-0.64%
Norway	0.187	0.194	0.225	0.249	0.265	0.253	0.240	0.225	1.85%	1.64%	-1.08%
Poland	0.573	0.606	0.617	0.684	0.738	0.772	0.787	0.787	0.75%	1.80%	0.43%
Portugal	0.152	0.182	0.145	0.152	0.157	0.161	0.166	0.167	-0.46%	0.83%	0.40%
Romania	0.643	0.455	0.454	0.493	0.519	0.528	0.533	0.519	-3.41%	1.35%	0.00%
Spain	1.188	1.265	1.050	1.091	1.129	1.152	1.178	1.207	-1.23%	0.73%	0.45%
Turkey	0.967	1.346	1.527	1.676	1.786	1.865	1.968	2.057	4.67%	1.58%	0.95%
United Kingdom	3.376	3.337	2.645	2.716	2.783	2.782	2.811	2.750	-2.41%	0.51%	-0.08%
Other Europe	2.324	2.192	1.887	2.012	2.129	2.180	2.199	2.172	-2.06%	1.21%	0.13%
Eurasia	**21.786**	**21.616**	**21.674**	**22.920**	**24.204**	**24.850**	**25.167**	**25.379**	**-0.05%**	**1.11%**	**0.32%**
Kazakhstan	0.477	0.303	0.474	0.555	0.637	0.691	0.731	0.765	-0.05%	3.00%	1.22%
Russia	14.330	15.471	15.275	15.674	16.148	16.235	16.161	15.962	0.64%	0.56%	-0.08%
Turkmenistan	0.629	0.720	0.765	0.928	1.092	1.222	1.343	1.448	1.99%	3.62%	1.90%
Ukraine	3.079	1.969	1.677	1.763	1.847	1.887	1.888	1.864	-5.90%	0.97%	0.06%
Uzbekistan	1.702	1.614	1.890	2.276	2.624	2.888	3.096	3.397	1.05%	3.34%	1.74%
Other Eurasia	1.569	1.538	1.592	1.724	1.855	1.928	1.947	1.943	0.15%	1.54%	0.31%
Middle East	**9.825**	**13.379**	**14.476**	**15.510**	**17.068**	**18.358**	**19.527**	**20.650**	**3.95%**	**1.66%**	**1.28%**
Iran	3.707	5.106	5.242	5.485	5.920	6.309	6.601	6.975	3.53%	1.22%	1.10%
Qatar	0.660	0.796	1.102	1.142	1.229	1.285	1.317	1.327	5.26%	1.09%	0.52%
Oman	0.324	0.620	0.710	0.780	0.857	0.908	0.945	0.980	8.17%	1.90%	0.90%
Saudi Arabia	2.516	3.096	3.510	3.894	4.419	4.845	5.201	5.470	3.39%	2.33%	1.43%
United Arab Emirates	1.457	2.147	2.203	2.296	2.457	2.551	2.709	2.854	4.22%	1.10%	1.00%
Other Middle East	1.160	1.614	1.708	1.913	2.186	2.460	2.754	3.044	3.94%	2.50%	2.23%
Africa	**2.979**	**3.535**	**3.897**	**4.608**	**5.569**	**6.597**	**7.717**	**8.845**	**2.72%**	**3.63%**	**3.13%**
Algeria	0.846	1.024	1.087	1.229	1.427	1.593	1.708	1.787	2.53%	2.76%	1.51%
Egypt	1.208	1.630	1.795	2.031	2.359	2.743	3.270	3.814	4.04%	2.77%	3.26%
Nigeria	0.366	0.178	0.261	0.373	0.539	0.722	0.914	1.139	-3.33%	7.53%	5.11%
Other Africa	0.559	0.702	0.755	0.975	1.244	1.539	1.825	2.105	3.05%	5.12%	3.57%
Asia & Oceania	**13.741**	**20.677**	**24.169**	**31.090**	**36.307**	**41.063**	**44.806**	**45.285**	**5.81%**	**4.15%**	**1.48%**
Australia	1.014	1.249	1.546	1.818	1.919	2.000	2.077	2.119	4.31%	2.19%	0.66%
China	1.655	3.769	6.019	9.099	12.118	14.942	17.215	18.052	13.79%	7.25%	2.69%
India	1.269	2.277	1.959	2.803	3.373	4.019	4.587	4.707	4.44%	5.59%	2.25%
Indonesia	0.638	1.397	1.384	1.658	1.990	2.386	2.745	3.028	8.04%	3.70%	2.84%
Japan	3.110	3.861	4.233	4.451	4.282	4.131	4.052	3.789	3.13%	0.11%	-0.81%
Malaysia	0.914	1.145	1.084	1.310	1.445	1.535	1.562	1.463	1.72%	2.92%	0.08%
Myanmar	0.146	0.114	0.119	0.164	0.213	0.280	0.338	0.360	-2.03%	6.01%	3.54%
Pakistan	1.088	1.400	1.331	1.676	2.016	2.199	2.331	2.350	2.04%	4.23%	1.03%
Singapore	0.233	0.297	0.370	0.418	0.426	0.423	0.413	0.395	4.72%	1.41%	-0.49%
South Korea	1.076	1.524	1.965	2.428	2.602	2.706	2.720	2.591	6.20%	2.85%	-0.03%
Thailand	1.150	1.592	1.838	2.184	2.352	2.425	2.508	2.286	4.80%	2.49%	-0.19%
Other Asia & Oceania	1.447	2.051	2.321	3.080	3.572	4.017	4.258	4.146	4.84%	4.40%	1.00%
World	**99.448**	**113.816**	**120.748**	**133.981**	**146.224**	**155.452**	**163.298**	**167.374**	**1.96%**	**1.93%**	**0.90%**

D3. Supply (tcf)[47]

Ref_Ref Case (Supply)

	2005	2010	2015	2020	2025	2030	2035	2040	cagr 2005-15	cagr 2015-25	cagr 2025-40
North America	**27.461**	**30.089**	**34.996**	**38.740**	**41.131**	**42.312**	**43.034**	**44.467**	**2.45%**	**1.63%**	**0.52%**
Canada	7.185	5.909	5.936	7.687	8.591	8.770	8.846	9.392	-1.89%	3.77%	0.60%
Mexico	1.349	1.799	1.251	0.683	0.895	1.863	3.060	4.274	-0.74%	-3.30%	10.99%
United States	18.927	22.382	27.809	30.370	31.645	31.679	31.128	30.802	3.92%	1.30%	-0.18%
Central & South America	**5.318**	**6.267**	**6.517**	**6.700**	**7.510**	**8.125**	**8.714**	**9.087**	**2.05%**	**1.43%**	**1.28%**
Argentina	1.753	1.585	1.386	2.475	3.117	3.557	3.859	4.099	-2.32%	8.44%	1.84%
Brazil	0.432	0.570	0.762	0.338	0.158	0.097	0.048	0.024	5.84%	-14.59%	-11.91%
Chile	0.068	0.065	0.025	0.011	0.005	0.002	0.051	0.075	-9.34%	-15.00%	19.79%
Colombia	0.253	0.454	0.502	0.427	0.315	0.224	0.191	0.318	7.08%	-4.55%	0.07%
Peru	0.073	0.291	0.442	0.453	0.486	0.511	0.533	0.540	19.65%	0.96%	0.70%
Trinidad and Tobago	1.094	1.512	1.448	1.270	1.362	1.382	1.539	1.526	2.84%	-0.61%	0.76%
Venezuela	1.172	1.201	1.253	1.223	1.546	1.804	1.925	1.870	0.66%	2.13%	1.27%
Other Central & South America	0.472	0.589	0.699	0.503	0.520	0.547	0.568	0.635	4.00%	-2.91%	1.34%
Europe	**11.723**	**11.155**	**9.793**	**9.983**	**10.357**	**10.230**	**10.043**	**9.740**	**-1.78%**	**0.56%**	**-0.41%**
Austria	0.061	0.064	0.041	0.028	0.030	0.018	0.011	0.007	-3.93%	-3.02%	-9.14%
Belgium	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	---	---	---
France	0.063	0.048	0.013	0.006	0.003	0.020	0.014	0.009	-14.60%	-14.47%	8.33%
Germany	0.689	0.526	0.330	0.164	0.200	0.203	0.471	0.524	-7.09%	-4.89%	6.63%
Italy	0.426	0.297	0.239	0.120	0.193	0.239	0.171	0.109	-5.63%	-2.08%	-3.76%
Netherlands	2.773	3.131	3.166	3.078	2.643	2.057	1.435	0.885	1.33%	-1.79%	-7.03%
Norway	3.196	3.849	3.705	3.979	4.284	3.958	3.350	3.199	1.49%	1.46%	-1.93%
Poland	0.214	0.215	0.191	0.215	0.312	0.663	1.037	1.591	-1.14%	5.06%	11.47%
Portugal	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	---	---	---
Romania	0.413	0.374	0.352	0.448	0.449	0.332	0.324	0.299	-1.60%	2.47%	-2.67%
Spain	0.006	0.002	0.001	0.001	0.000	0.007	0.010	0.060	-13.89%	-9.71%	38.07%
Turkey	0.032	0.024	0.054	0.117	0.150	0.139	0.090	0.031	5.44%	10.77%	-10.04%
United Kingdom	3.275	2.124	1.328	1.471	1.733	2.206	2.782	2.749	-8.63%	2.70%	3.13%
Other Europe	0.574	0.502	0.374	0.355	0.361	0.388	0.348	0.277	-4.20%	-0.36%	-1.75%
Eurasia	**27.386**	**27.903**	**28.402**	**30.205**	**32.584**	**34.057**	**35.381**	**36.891**	**0.36%**	**1.38%**	**0.83%**
Kazakhstan	0.428	0.441	0.631	1.038	1.338	1.476	1.490	1.605	3.96%	7.81%	1.22%
Russia	21.698	22.372	21.607	22.250	23.724	24.621	25.528	26.602	-0.04%	0.94%	0.77%
Turkmenistan	2.225	1.600	2.559	3.153	3.708	4.223	5.106	5.929	1.41%	3.78%	3.18%
Ukraine	0.685	0.684	0.604	0.292	0.280	0.552	0.817	0.943	-1.25%	-7.39%	8.42%
Uzbekistan	2.119	2.130	2.445	3.088	3.088	2.530	1.697	1.070	1.44%	2.36%	-6.82%
Other Eurasia	0.232	0.677	0.556	0.385	0.447	0.655	0.743	0.743	9.11%	-2.15%	3.45%
Middle East	**12.334**	**18.699**	**21.349**	**22.477**	**24.018**	**25.488**	**27.122**	**28.346**	**5.64%**	**1.19%**	**1.11%**
Iran	3.818	6.031	6.405	6.723	7.111	7.453	7.753	8.050	5.31%	1.05%	0.83%
Qatar	1.826	4.359	5.707	5.931	6.212	6.535	6.743	6.766	12.07%	0.85%	0.57%
Oman	0.748	1.035	1.132	1.226	1.306	1.356	1.414	1.453	4.23%	1.44%	0.71%
Saudi Arabia	2.860	3.424	3.916	4.303	4.849	5.318	5.740	6.202	3.19%	2.16%	1.65%
United Arab Emirates	1.828	1.992	2.005	1.887	1.860	1.906	2.086	2.216	0.93%	-0.75%	1.17%
Other Middle East	1.255	1.858	2.183	2.407	2.680	2.919	3.387	3.659	5.70%	2.07%	2.10%
Africa	**6.877**	**8.553**	**7.371**	**8.048**	**9.457**	**10.918**	**12.134**	**13.363**	**0.70%**	**2.52%**	**2.33%**
Algeria	3.613	3.465	3.413	3.349	3.727	4.000	4.040	3.741	-0.57%	0.89%	0.02%
Egypt	1.610	2.284	1.748	1.929	2.060	1.971	2.318	2.892	0.82%	1.66%	2.29%
Nigeria	0.862	1.317	1.172	1.105	1.472	1.950	2.342	3.101	3.13%	2.30%	5.10%
Other Africa	0.792	1.486	1.038	1.666	2.198	2.998	3.434	3.629	2.74%	7.79%	3.40%
Asia & Oceania	**12.907**	**17.527**	**19.368**	**24.557**	**28.655**	**32.515**	**36.498**	**39.742**	**4.14%**	**3.99%**	**2.20%**
Australia	1.266	1.708	3.518	5.323	6.149	6.280	6.389	6.474	10.76%	5.74%	0.34%
China	1.763	3.334	3.814	4.166	5.821	8.752	12.309	15.672	8.02%	4.32%	6.83%
India	1.153	1.848	1.179	1.943	2.316	2.556	2.347	2.297	0.22%	6.98%	-0.05%
Indonesia	2.406	3.047	2.472	3.070	3.646	4.432	5.249	6.308	0.27%	3.97%	3.72%
Japan	0.191	0.171	0.072	0.020	0.018	0.011	0.008	0.005	-9.31%	-13.03%	-8.48%
Malaysia	2.147	2.347	2.635	3.625	3.962	3.950	3.511	2.884	2.07%	4.16%	-2.10%
Myanmar	0.479	0.437	0.410	0.489	0.559	0.612	1.030	1.310	-1.54%	3.15%	5.84%
Pakistan	1.194	1.484	1.432	1.779	1.938	1.937	1.772	1.347	1.83%	3.08%	-2.40%
Singapore	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	---	---	---
South Korea	0.017	0.033	0.013	0.003	0.004	0.002	0.001	0.000	-3.08%	-10.02%	-14.21%
Thailand	0.925	1.378	1.524	1.366	1.160	0.820	0.904	0.897	5.12%	-2.69%	-1.70%
Other Asia & Oceania	1.366	1.739	2.301	2.772	3.081	3.162	2.977	2.548	5.35%	2.96%	-1.26%
World	**104.006**	**120.194**	**127.797**	**140.711**	**153.713**	**163.644**	**172.927**	**181.637**	**2.08%**	**1.86%**	**1.12%**

[47] Supply is marketed production. Historical data match those reported by EIA.

Ref_HRR Case (Supply)(tcf)

	2005	2010	2015	2020	2025	2030	2035	2040	cagr 2005-15	cagr 2015-25	cagr 2025-40
North America	**27.461**	**30.089**	**35.109**	**39.585**	**42.280**	**43.265**	**44.228**	**45.970**	**2.49%**	**1.88%**	**0.56%**
Canada	7.185	5.909	5.680	6.512	7.884	8.469	8.787	9.435	-2.32%	3.33%	1.20%
Mexico	1.349	1.799	1.251	0.666	0.870	1.060	1.928	3.006	-0.75%	-3.57%	8.62%
United States	18.927	22.382	28.177	32.408	33.526	33.736	33.513	33.529	4.06%	1.75%	0.00%
Central & South America	**5.318**	**6.267**	**6.510**	**6.682**	**7.482**	**8.155**	**8.714**	**9.096**	**2.04%**	**1.40%**	**1.31%**
Argentina	1.753	1.585	1.386	2.451	3.113	3.559	3.854	4.110	-2.32%	8.43%	1.87%
Brazil	0.432	0.570	0.762	0.338	0.159	0.097	0.049	0.024	5.84%	-14.49%	-11.97%
Chile	0.068	0.065	0.025	0.011	0.005	0.002	0.050	0.075	-9.34%	-15.00%	19.81%
Colombia	0.253	0.454	0.502	0.427	0.315	0.223	0.200	0.308	7.08%	-4.56%	-0.15%
Peru	0.073	0.291	0.442	0.454	0.483	0.506	0.532	0.521	19.66%	0.90%	0.50%
Trinidad and Tobago	1.094	1.512	1.445	1.269	1.341	1.421	1.545	1.527	2.82%	-0.75%	0.87%
Venezuela	1.172	1.201	1.253	1.224	1.547	1.809	1.904	1.901	0.66%	2.13%	1.38%
Other Central & South America	0.472	0.589	0.694	0.506	0.518	0.539	0.579	0.630	3.92%	-2.88%	1.31%
Europe	**11.723**	**11.155**	**9.794**	**9.923**	**10.246**	**10.186**	**10.048**	**9.636**	**-1.78%**	**0.45%**	**-0.41%**
Austria	0.061	0.064	0.041	0.028	0.031	0.018	0.011	0.007	-3.85%	-2.86%	-9.30%
Belgium	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	---	---	---
France	0.063	0.048	0.013	0.006	0.003	0.020	0.013	0.009	-14.57%	-14.50%	8.25%
Germany	0.689	0.526	0.330	0.158	0.195	0.200	0.466	0.519	-7.11%	-5.14%	6.76%
Italy	0.426	0.297	0.239	0.112	0.178	0.244	0.179	0.112	-5.63%	-2.88%	-3.03%
Netherlands	2.773	3.131	3.164	3.059	2.638	2.052	1.433	0.910	1.33%	-1.80%	-6.85%
Norway	3.196	3.849	3.704	3.954	4.255	3.961	3.379	3.204	1.49%	1.40%	-1.87%
Poland	0.214	0.215	0.190	0.209	0.309	0.610	0.980	1.428	-1.19%	5.00%	10.74%
Portugal	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	---	---	---
Romania	0.413	0.374	0.354	0.447	0.448	0.336	0.328	0.301	-1.54%	2.39%	-2.63%
Spain	0.006	0.002	0.001	0.001	0.000	0.010	0.010	0.058	-13.89%	-13.37%	41.53%
Turkey	0.032	0.024	0.053	0.124	0.144	0.141	0.088	0.032	5.33%	10.48%	-9.50%
United Kingdom	3.275	2.124	1.333	1.475	1.697	2.201	2.796	2.772	-8.60%	2.44%	3.33%
Other Europe	0.574	0.502	0.373	0.352	0.348	0.393	0.364	0.285	-4.23%	-0.69%	-1.32%
Eurasia	**27.386**	**27.903**	**28.399**	**30.186**	**32.558**	**34.084**	**35.369**	**36.463**	**0.36%**	**1.38%**	**0.76%**
Kazakhstan	0.428	0.441	0.630	1.035	1.327	1.473	1.508	1.552	3.94%	7.74%	1.05%
Russia	21.698	22.372	21.602	22.224	23.674	24.607	25.490	26.207	-0.04%	0.92%	0.68%
Turkmenistan	2.225	1.600	2.561	3.145	3.737	4.262	5.117	5.924	1.42%	3.85%	3.12%
Ukraine	0.685	0.684	0.604	0.289	0.270	0.561	0.823	0.948	-1.25%	-7.73%	8.72%
Uzbekistan	2.119	2.130	2.447	3.108	3.099	2.519	1.679	1.083	1.45%	2.39%	-6.77%
Other Eurasia	0.232	0.677	0.555	0.385	0.450	0.662	0.752	0.750	9.10%	-2.07%	3.46%
Middle East	**12.334**	**18.699**	**21.353**	**22.486**	**24.034**	**25.523**	**27.124**	**28.331**	**5.64%**	**1.19%**	**1.10%**
Iran	3.818	6.031	6.406	6.725	7.117	7.458	7.746	8.039	5.31%	1.06%	0.82%
Qatar	1.826	4.359	5.705	5.927	6.214	6.562	6.741	6.767	12.07%	0.86%	0.57%
Oman	0.748	1.035	1.132	1.226	1.306	1.356	1.414	1.452	4.23%	1.44%	0.71%
Saudi Arabia	2.860	3.424	3.916	4.304	4.850	5.315	5.762	6.231	3.19%	2.16%	1.68%
United Arab Emirates	1.828	1.992	2.007	1.891	1.858	1.915	2.089	2.219	0.94%	-0.77%	1.19%
Other Middle East	1.255	1.858	2.187	2.412	2.689	2.916	3.372	3.622	5.71%	2.09%	2.01%
Africa	**6.877**	**8.553**	**7.384**	**8.022**	**9.345**	**10.939**	**12.178**	**13.408**	**0.71%**	**2.38%**	**2.44%**
Algeria	3.613	3.465	3.414	3.343	3.693	3.999	4.021	3.748	-0.56%	0.79%	0.10%
Egypt	1.610	2.284	1.755	1.915	2.012	1.978	2.329	2.881	0.86%	1.37%	2.42%
Nigeria	0.862	1.317	1.175	1.102	1.432	1.957	2.360	3.098	3.15%	2.00%	5.28%
Other Africa	0.792	1.486	1.039	1.663	2.209	3.005	3.469	3.681	2.75%	7.83%	3.46%
Asia & Oceania	**12.907**	**17.527**	**19.376**	**24.435**	**28.445**	**32.237**	**36.268**	**39.370**	**4.15%**	**3.91%**	**2.19%**
Australia	1.266	1.708	3.533	5.288	6.133	6.222	6.334	6.414	10.81%	5.67%	0.30%
China	1.763	3.334	3.812	4.108	5.705	8.564	12.102	15.465	8.02%	4.11%	6.87%
India	1.153	1.848	1.178	1.937	2.285	2.568	2.369	2.281	0.21%	6.85%	-0.01%
Indonesia	2.406	3.047	2.469	3.048	3.645	4.429	5.256	6.197	0.26%	3.97%	3.60%
Japan	0.191	0.171	0.072	0.021	0.016	0.012	0.008	0.005	-9.33%	-13.94%	-7.88%
Malaysia	2.147	2.347	2.637	3.625	3.937	3.918	3.490	2.889	2.08%	4.09%	-2.04%
Myanmar	0.479	0.437	0.411	0.491	0.557	0.609	1.029	1.314	-1.51%	3.09%	5.89%
Pakistan	1.194	1.484	1.432	1.779	1.922	1.920	1.777	1.360	1.84%	2.99%	-2.28%
Singapore	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	---	---	---
South Korea	0.017	0.033	0.013	0.003	0.004	0.002	0.001	0.000	-3.09%	-10.60%	-13.83%
Thailand	0.925	1.378	1.524	1.363	1.162	0.825	0.893	0.897	5.11%	-2.67%	-1.71%
Other Asia & Oceania	1.366	1.739	2.298	2.773	3.079	3.166	3.009	2.547	5.34%	2.97%	-1.26%
World	**104.006**	**120.194**	**127.924**	**141.320**	**154.391**	**164.389**	**173.929**	**182.274**	**2.09%**	**1.90%**	**1.11%**

Ref_LRR Case (Supply)(tcf)

	2005	2010	2015	2020	2025	2030	2035	2040	cagr 2005-15	cagr 2015-25	cagr 2025-40
North America	**27.461**	**30.089**	**34.662**	**38.199**	**40.093**	**40.523**	**41.785**	**43.271**	**2.36%**	**1.47%**	**0.51%**
Canada	7.185	5.909	6.148	8.151	8.726	8.778	8.869	9.505	-1.55%	3.56%	0.57%
Mexico	1.349	1.799	1.251	0.786	1.348	2.733	4.224	5.089	-0.74%	0.75%	9.26%
United States	18.927	22.382	27.263	29.262	30.019	29.013	28.691	28.676	3.72%	0.97%	-0.30%
Central & South America	**5.318**	**6.267**	**6.518**	**6.712**	**7.555**	**8.186**	**8.745**	**9.107**	**2.05%**	**1.49%**	**1.25%**
Argentina	1.753	1.585	1.386	2.484	3.116	3.558	3.855	4.105	-2.32%	8.44%	1.86%
Brazil	0.432	0.570	0.762	0.338	0.157	0.096	0.048	0.023	5.84%	-14.63%	-11.99%
Chile	0.068	0.065	0.025	0.011	0.005	0.002	0.051	0.075	-9.34%	-15.00%	19.76%
Colombia	0.253	0.454	0.502	0.427	0.315	0.223	0.205	0.307	7.08%	-4.56%	-0.16%
Peru	0.073	0.291	0.441	0.456	0.485	0.505	0.534	0.568	19.64%	0.95%	1.05%
Trinidad and Tobago	1.094	1.512	1.453	1.266	1.413	1.460	1.544	1.523	2.87%	-0.28%	0.50%
Venezuela	1.172	1.201	1.253	1.224	1.546	1.801	1.915	1.887	0.66%	2.12%	1.34%
Other Central & South America	0.472	0.589	0.695	0.506	0.519	0.540	0.594	0.618	3.94%	-2.88%	1.17%
Europe	**11.723**	**11.155**	**9.795**	**10.048**	**10.404**	**10.274**	**9.977**	**9.721**	**-1.78%**	**0.60%**	**-0.45%**
Austria	0.061	0.064	0.041	0.029	0.031	0.018	0.011	0.007	-3.84%	-2.79%	-9.16%
Belgium	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	---	---	---
France	0.063	0.048	0.013	0.006	0.004	0.019	0.013	0.009	-14.61%	-10.47%	5.03%
Germany	0.689	0.526	0.329	0.163	0.206	0.202	0.467	0.525	-7.11%	-4.60%	6.44%
Italy	0.426	0.297	0.239	0.121	0.194	0.240	0.171	0.112	-5.63%	-2.06%	-3.57%
Netherlands	2.773	3.131	3.170	3.087	2.646	2.066	1.413	0.875	1.35%	-1.79%	-7.11%
Norway	3.196	3.849	3.709	3.995	4.293	3.961	3.356	3.214	1.50%	1.47%	-1.91%
Poland	0.214	0.215	0.192	0.210	0.312	0.649	1.011	1.580	-1.08%	4.98%	11.42%
Portugal	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	---	---	---
Romania	0.413	0.374	0.351	0.447	0.450	0.336	0.324	0.307	-1.63%	2.52%	-2.51%
Spain	0.006	0.002	0.001	0.001	0.003	0.010	0.009	0.050	-13.88%	7.61%	21.27%
Turkey	0.032	0.024	0.054	0.152	0.144	0.135	0.081	0.031	5.53%	10.22%	-9.64%
United Kingdom	3.275	2.124	1.322	1.477	1.750	2.245	2.775	2.739	-8.67%	2.85%	3.03%
Other Europe	0.574	0.502	0.374	0.359	0.372	0.393	0.347	0.272	-4.20%	-0.06%	-2.05%
Eurasia	**27.386**	**27.903**	**28.392**	**30.234**	**32.617**	**34.151**	**35.495**	**36.715**	**0.36%**	**1.40%**	**0.79%**
Kazakhstan	0.428	0.441	0.630	1.045	1.344	1.482	1.538	1.627	3.94%	7.88%	1.28%
Russia	21.698	22.372	21.598	22.244	23.696	24.659	25.611	26.401	-0.05%	0.93%	0.72%
Turkmenistan	2.225	1.600	2.562	3.161	3.713	4.198	5.088	5.884	1.42%	3.78%	3.12%
Ukraine	0.685	0.684	0.604	0.291	0.301	0.589	0.831	0.966	-1.25%	-6.73%	8.08%
Uzbekistan	2.119	2.130	2.444	3.101	3.101	2.536	1.678	1.088	1.44%	2.41%	-6.74%
Other Eurasia	0.232	0.677	0.555	0.392	0.462	0.688	0.748	0.748	9.10%	-1.82%	3.27%
Middle East	**12.334**	**18.699**	**21.351**	**22.489**	**24.023**	**25.590**	**27.154**	**28.352**	**5.64%**	**1.19%**	**1.11%**
Iran	3.818	6.031	6.406	6.728	7.107	7.464	7.765	8.041	5.31%	1.04%	0.83%
Qatar	1.826	4.359	5.705	5.925	6.212	6.595	6.741	6.780	12.07%	0.86%	0.58%
Oman	0.748	1.035	1.132	1.226	1.306	1.358	1.418	1.452	4.23%	1.44%	0.71%
Saudi Arabia	2.860	3.424	3.916	4.302	4.850	5.326	5.754	6.226	3.19%	2.16%	1.68%
United Arab Emirates	1.828	1.992	2.007	1.894	1.861	1.914	2.083	2.226	0.94%	-0.75%	1.20%
Other Middle East	1.255	1.858	2.184	2.414	2.686	2.934	3.393	3.626	5.70%	2.09%	2.02%
Africa	**6.877**	**8.553**	**7.381**	**8.078**	**9.578**	**10.931**	**12.141**	**13.404**	**0.71%**	**2.64%**	**2.27%**
Algeria	3.613	3.465	3.413	3.356	3.741	4.007	4.002	3.705	-0.57%	0.92%	-0.06%
Egypt	1.610	2.284	1.748	1.931	2.074	1.978	2.313	2.896	0.82%	1.73%	2.25%
Nigeria	0.862	1.317	1.183	1.104	1.569	1.959	2.387	3.132	3.22%	2.86%	4.72%
Other Africa	0.792	1.486	1.038	1.688	2.195	2.986	3.438	3.671	2.74%	7.77%	3.49%
Asia & Oceania	**12.907**	**17.527**	**19.372**	**24.656**	**28.903**	**32.858**	**36.708**	**39.579**	**4.14%**	**4.08%**	**2.12%**
Australia	1.266	1.708	3.523	5.360	6.137	6.242	6.340	6.378	10.78%	5.71%	0.26%
China	1.763	3.334	3.816	4.184	5.978	8.977	12.472	15.598	8.03%	4.59%	6.60%
India	1.153	1.848	1.181	1.955	2.330	2.609	2.343	2.300	0.24%	7.03%	-0.09%
Indonesia	2.406	3.047	2.473	3.092	3.664	4.473	5.303	6.370	0.28%	4.01%	3.76%
Japan	0.191	0.171	0.072	0.021	0.019	0.012	0.008	0.005	-9.30%	-12.54%	-8.90%
Malaysia	2.147	2.347	2.639	3.629	3.989	3.963	3.498	2.865	2.08%	4.22%	-2.18%
Myanmar	0.479	0.437	0.408	0.492	0.555	0.608	1.030	1.303	-1.57%	3.11%	5.86%
Pakistan	1.194	1.484	1.431	1.779	1.973	1.971	1.769	1.340	1.83%	3.26%	-2.55%
Singapore	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	---	---	---
South Korea	0.017	0.033	0.013	0.003	0.005	0.002	0.001	0.000	-3.06%	-9.80%	-14.36%
Thailand	0.925	1.378	1.521	1.357	1.169	0.833	0.910	0.885	5.10%	-2.60%	-1.84%
Other Asia & Oceania	1.366	1.739	2.295	2.785	3.085	3.167	3.033	2.535	5.32%	3.00%	-1.30%
World	**104.006**	**120.194**	**127.472**	**140.417**	**153.173**	**162.513**	**172.003**	**180.150**	**2.06%**	**1.85%**	**1.09%**

Ref_Hi-D Case (Supply)(tcf)

	2005	2010	2015	2020	2025	2030	2035	2040	cagr 2005-15	cagr 2015-25	cagr 2025-40
North America	**27.461**	**30.089**	**35.067**	**39.653**	**42.638**	**44.584**	**45.425**	**46.828**	**2.48%**	**1.97%**	**0.63%**
Canada	7.185	5.909	5.979	7.897	8.693	8.781	8.854	9.411	-1.82%	3.81%	0.53%
Mexico	1.349	1.799	1.251	0.708	0.982	2.251	3.418	4.850	-0.74%	-2.39%	11.23%
United States	18.927	22.382	27.836	31.048	32.962	33.551	33.153	32.567	3.93%	1.70%	-0.08%
Central & South America	**5.318**	**6.267**	**6.515**	**6.706**	**7.526**	**8.116**	**8.725**	**9.101**	**2.05%**	**1.45%**	**1.28%**
Argentina	1.753	1.585	1.386	2.479	3.117	3.561	3.855	4.110	-2.32%	8.44%	1.86%
Brazil	0.432	0.570	0.762	0.338	0.159	0.097	0.048	0.024	5.84%	-14.54%	-11.80%
Chile	0.068	0.065	0.025	0.011	0.005	0.002	0.050	0.075	-9.34%	-15.00%	19.77%
Colombia	0.253	0.454	0.502	0.427	0.315	0.223	0.199	0.311	7.08%	-4.56%	-0.08%
Peru	0.073	0.291	0.441	0.453	0.487	0.512	0.534	0.554	19.63%	0.99%	0.86%
Trinidad and Tobago	1.094	1.512	1.448	1.269	1.383	1.396	1.535	1.521	2.84%	-0.46%	0.64%
Venezuela	1.172	1.201	1.253	1.219	1.542	1.782	1.923	1.883	0.66%	2.10%	1.34%
Other Central & South America	0.472	0.589	0.697	0.509	0.519	0.543	0.581	0.623	3.98%	-2.90%	1.22%
Europe	**11.723**	**11.155**	**9.796**	**10.005**	**10.392**	**10.191**	**10.065**	**9.682**	**-1.78%**	**0.59%**	**-0.47%**
Austria	0.061	0.064	0.041	0.029	0.029	0.018	0.011	0.007	-3.83%	-3.54%	-8.90%
Belgium	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	---	---	---
France	0.063	0.048	0.013	0.006	0.004	0.019	0.013	0.009	-14.60%	-11.88%	5.88%
Germany	0.689	0.526	0.330	0.162	0.200	0.193	0.467	0.520	-7.11%	-4.85%	6.56%
Italy	0.426	0.297	0.239	0.122	0.196	0.239	0.172	0.110	-5.63%	-1.96%	-3.77%
Netherlands	2.773	3.131	3.169	3.076	2.662	2.037	1.429	0.885	1.34%	-1.73%	-7.08%
Norway	3.196	3.849	3.706	3.987	4.297	3.961	3.371	3.183	1.49%	1.49%	-1.98%
Poland	0.214	0.215	0.192	0.214	0.317	0.662	1.037	1.581	-1.09%	5.15%	11.31%
Portugal	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	---	---	---
Romania	0.413	0.374	0.351	0.447	0.448	0.339	0.332	0.305	-1.61%	2.47%	-2.54%
Spain	0.006	0.002	0.001	0.001	0.003	0.009	0.009	0.057	-13.89%	7.79%	22.18%
Turkey	0.032	0.024	0.053	0.140	0.138	0.133	0.086	0.032	5.38%	9.92%	-9.35%
United Kingdom	3.275	2.124	1.326	1.466	1.735	2.196	2.792	2.722	-8.64%	2.72%	3.05%
Other Europe	0.574	0.502	0.375	0.356	0.364	0.385	0.347	0.272	-4.18%	-0.29%	-1.92%
Eurasia	**27.386**	**27.903**	**28.392**	**30.216**	**32.563**	**34.009**	**35.274**	**36.447**	**0.36%**	**1.38%**	**0.75%**
Kazakhstan	0.428	0.441	0.630	1.045	1.315	1.465	1.523	1.601	3.94%	7.64%	1.32%
Russia	21.698	22.372	21.595	22.224	23.661	24.546	25.412	26.162	-0.05%	0.92%	0.67%
Turkmenistan	2.225	1.600	2.564	3.159	3.743	4.234	5.085	5.901	1.43%	3.86%	3.08%
Ukraine	0.685	0.684	0.604	0.298	0.284	0.550	0.816	0.948	-1.25%	-7.26%	8.36%
Uzbekistan	2.119	2.130	2.444	3.103	3.103	2.532	1.684	1.081	1.44%	2.42%	-6.79%
Other Eurasia	0.232	0.677	0.555	0.388	0.456	0.682	0.753	0.754	9.10%	-1.95%	3.41%
Middle East	**12.334**	**18.699**	**21.348**	**22.481**	**24.034**	**25.532**	**27.125**	**28.351**	**5.64%**	**1.19%**	**1.11%**
Iran	3.818	6.031	6.406	6.723	7.117	7.462	7.760	8.041	5.31%	1.06%	0.82%
Qatar	1.826	4.359	5.705	5.928	6.209	6.550	6.742	6.761	12.07%	0.85%	0.57%
Oman	0.748	1.035	1.132	1.226	1.307	1.357	1.415	1.458	4.23%	1.44%	0.73%
Saudi Arabia	2.860	3.424	3.917	4.302	4.852	5.331	5.755	6.222	3.19%	2.16%	1.67%
United Arab Emirates	1.828	1.992	2.007	1.890	1.866	1.910	2.080	2.240	0.94%	-0.72%	1.23%
Other Middle East	1.255	1.858	2.181	2.411	2.685	2.922	3.374	3.629	5.68%	2.10%	2.03%
Africa	**6.877**	**8.553**	**7.380**	**8.063**	**9.518**	**10.930**	**12.144**	**13.380**	**0.71%**	**2.58%**	**2.30%**
Algeria	3.613	3.465	3.413	3.358	3.761	3.999	4.045	3.747	-0.57%	0.97%	-0.02%
Egypt	1.610	2.284	1.749	1.920	2.029	1.964	2.324	2.883	0.83%	1.50%	2.37%
Nigeria	0.862	1.317	1.181	1.104	1.521	1.967	2.343	3.125	3.20%	2.56%	4.92%
Other Africa	0.792	1.486	1.037	1.681	2.207	3.000	3.432	3.626	2.73%	7.85%	3.36%
Asia & Oceania	**12.907**	**17.527**	**19.376**	**24.600**	**28.679**	**32.394**	**36.279**	**39.427**	**4.15%**	**4.00%**	**2.14%**
Australia	1.266	1.708	3.522	5.341	6.143	6.217	6.311	6.336	10.78%	5.72%	0.21%
China	1.763	3.334	3.818	4.174	5.846	8.692	12.121	15.585	8.03%	4.35%	6.76%
India	1.153	1.848	1.180	1.942	2.314	2.547	2.352	2.293	0.23%	6.96%	-0.06%
Indonesia	2.406	3.047	2.471	3.086	3.652	4.428	5.245	6.229	0.27%	3.98%	3.62%
Japan	0.191	0.171	0.072	0.021	0.018	0.011	0.008	0.005	-9.30%	-12.77%	-8.76%
Malaysia	2.147	2.347	2.643	3.630	3.963	3.954	3.514	2.864	2.10%	4.13%	-2.14%
Myanmar	0.479	0.437	0.410	0.489	0.558	0.611	1.030	1.321	-1.53%	3.14%	5.91%
Pakistan	1.194	1.484	1.432	1.779	1.934	1.934	1.771	1.358	1.83%	3.06%	-2.33%
Singapore	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	---	---	---
South Korea	0.017	0.033	0.013	0.003	0.005	0.002	0.001	0.000	-3.10%	-9.80%	-14.34%
Thailand	0.925	1.378	1.519	1.358	1.165	0.829	0.910	0.881	5.08%	-2.62%	-1.85%
Other Asia & Oceania	1.366	1.739	2.296	2.776	3.080	3.169	3.017	2.554	5.33%	2.98%	-1.24%
World	**104.006**	**120.194**	**127.873**	**141.724**	**155.350**	**165.756**	**175.038**	**183.216**	**2.09%**	**1.97%**	**1.11%**

LNG12_Ref Case (Supply)(tcf)

	2005	2010	2015	2020	2025	2030	2035	2040	cagr 2005-15	cagr 2015-25	cagr 2025-40
North America	**27.461**	**30.089**	**34.950**	**39.311**	**41.905**	**42.808**	**44.955**	**46.386**	**2.44%**	**1.83%**	**0.68%**
Canada	7.185	5.909	5.871	7.453	8.541	8.798	9.254	9.347	-2.00%	3.82%	0.60%
Mexico	1.349	1.799	1.251	0.688	0.904	1.844	3.259	4.850	-0.74%	-3.20%	11.85%
United States	18.927	22.382	27.828	31.169	32.461	32.166	32.442	32.190	3.93%	1.55%	-0.06%
Central & South America	**5.318**	**6.267**	**6.504**	**6.750**	**7.745**	**8.352**	**8.937**	**9.061**	**2.03%**	**1.76%**	**1.05%**
Argentina	1.753	1.585	1.386	2.484	3.123	3.563	3.860	4.115	-2.32%	8.46%	1.86%
Brazil	0.432	0.570	0.762	0.338	0.157	0.096	0.048	0.023	5.84%	-14.62%	-11.96%
Chile	0.068	0.065	0.025	0.011	0.005	0.003	0.049	0.075	-9.34%	-15.00%	19.76%
Colombia	0.253	0.454	0.502	0.427	0.315	0.223	0.205	0.268	7.08%	-4.56%	-1.08%
Peru	0.073	0.291	0.440	0.455	0.486	0.523	0.567	0.578	19.61%	0.99%	1.16%
Trinidad and Tobago	1.094	1.512	1.440	1.300	1.543	1.560	1.546	1.530	2.79%	0.69%	-0.06%
Venezuela	1.172	1.201	1.253	1.222	1.588	1.819	2.054	1.848	0.66%	2.40%	1.02%
Other Central & South America	0.472	0.589	0.695	0.512	0.529	0.565	0.608	0.624	3.94%	-2.70%	1.11%
Europe	**11.723**	**11.155**	**9.767**	**9.930**	**10.065**	**9.335**	**8.495**	**7.454**	**-1.81%**	**0.30%**	**-1.98%**
Austria	0.061	0.064	0.042	0.029	0.030	0.018	0.011	0.007	-3.77%	-3.13%	-8.95%
Belgium	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	---	---	---
France	0.063	0.048	0.013	0.006	0.009	0.019	0.012	0.026	-14.42%	-4.39%	7.80%
Germany	0.689	0.526	0.329	0.165	0.226	0.444	0.583	0.454	-7.13%	-3.70%	4.77%
Italy	0.426	0.297	0.239	0.137	0.226	0.237	0.154	0.101	-5.63%	-0.54%	-5.20%
Netherlands	2.773	3.131	3.126	2.889	2.357	1.572	0.929	0.585	1.21%	-2.79%	-8.87%
Norway	3.196	3.849	3.741	4.120	4.407	4.275	3.989	3.750	1.59%	1.65%	-1.07%
Poland	0.214	0.215	0.179	0.151	0.091	0.053	0.091	0.114	-1.74%	-6.55%	1.49%
Portugal	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	---	---	---
Romania	0.413	0.374	0.354	0.455	0.456	0.373	0.367	0.298	-1.52%	2.54%	-2.79%
Spain	0.006	0.002	0.001	0.001	0.005	0.013	0.038	0.181	-13.55%	13.73%	27.04%
Turkey	0.032	0.024	0.054	0.134	0.152	0.150	0.073	0.026	5.47%	10.94%	-11.05%
United Kingdom	3.275	2.124	1.310	1.461	1.706	1.781	1.897	1.644	-8.76%	2.68%	-0.25%
Other Europe	0.574	0.502	0.378	0.383	0.400	0.401	0.351	0.268	-4.09%	0.56%	-2.64%
Eurasia	**27.386**	**27.903**	**28.436**	**30.420**	**33.350**	**35.450**	**36.542**	**37.664**	**0.38%**	**1.61%**	**0.81%**
Kazakhstan	0.428	0.441	0.630	1.055	1.382	1.514	1.587	1.701	3.94%	8.18%	1.40%
Russia	21.698	22.372	21.624	22.341	24.015	25.428	26.245	26.901	-0.03%	1.05%	0.76%
Turkmenistan	2.225	1.600	2.571	3.180	3.854	4.493	5.346	6.250	1.46%	4.13%	3.28%
Ukraine	0.685	0.684	0.604	0.297	0.401	0.757	0.952	0.995	-1.25%	-4.02%	6.25%
Uzbekistan	2.119	2.130	2.450	3.133	3.136	2.527	1.666	1.064	1.47%	2.50%	-6.95%
Other Eurasia	0.232	0.677	0.557	0.414	0.563	0.731	0.747	0.754	9.14%	0.10%	1.97%
Middle East	**12.334**	**18.699**	**21.346**	**22.493**	**24.135**	**25.807**	**27.287**	**28.530**	**5.64%**	**1.24%**	**1.12%**
Iran	3.818	6.031	6.406	6.727	7.117	7.474	7.755	8.027	5.31%	1.06%	0.81%
Qatar	1.826	4.359	5.702	5.931	6.307	6.705	6.749	6.768	12.06%	1.01%	0.47%
Oman	0.748	1.035	1.134	1.227	1.310	1.386	1.421	1.455	4.25%	1.45%	0.70%
Saudi Arabia	2.860	3.424	3.917	4.302	4.853	5.341	5.746	6.187	3.19%	2.16%	1.63%
United Arab Emirates	1.828	1.992	2.004	1.884	1.859	1.910	2.086	2.211	0.92%	-0.74%	1.16%
Other Middle East	1.255	1.858	2.184	2.422	2.689	2.991	3.529	3.882	5.70%	2.10%	2.48%
Africa	**6.877**	**8.553**	**7.386**	**8.181**	**9.934**	**11.195**	**12.667**	**14.355**	**0.72%**	**3.01%**	**2.48%**
Algeria	3.613	3.465	3.427	3.433	3.818	4.068	4.076	3.804	-0.53%	1.09%	-0.02%
Egypt	1.610	2.284	1.750	1.929	2.081	2.087	2.542	3.119	0.83%	1.75%	2.74%
Nigeria	0.862	1.317	1.176	1.110	1.742	1.959	2.443	3.261	3.16%	4.01%	4.27%
Other Africa	0.792	1.486	1.033	1.709	2.293	3.082	3.607	4.170	2.69%	8.30%	4.07%
Asia & Oceania	**12.907**	**17.527**	**19.425**	**23.592**	**26.207**	**29.098**	**30.753**	**30.656**	**4.17%**	**3.04%**	**1.05%**
Australia	1.266	1.708	3.511	5.731	6.187	6.269	6.375	7.314	10.74%	5.83%	1.12%
China	1.763	3.334	3.796	2.815	3.206	4.317	4.995	5.429	7.97%	-1.67%	3.57%
India	1.153	1.848	1.209	1.462	1.586	1.943	2.184	1.673	0.47%	2.75%	0.36%
Indonesia	2.406	3.047	2.531	3.154	3.754	4.814	6.091	6.934	0.50%	4.02%	4.17%
Japan	0.191	0.171	0.078	0.026	0.025	0.016	0.008	0.005	-8.53%	-10.77%	-10.51%
Malaysia	2.147	2.347	2.633	3.590	4.026	4.206	3.690	3.094	2.06%	4.34%	-1.74%
Myanmar	0.479	0.437	0.414	0.536	0.620	0.904	1.434	1.402	-1.44%	4.13%	5.59%
Pakistan	1.194	1.484	1.431	1.781	2.145	2.256	1.839	1.252	1.83%	4.13%	-3.52%
Singapore	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	---	---	---
South Korea	0.017	0.033	0.014	0.005	0.005	0.002	0.001	0.000	-1.91%	-9.85%	-15.00%
Thailand	0.925	1.378	1.521	1.362	1.192	0.829	1.008	0.869	5.10%	-2.41%	-2.09%
Other Asia & Oceania	1.366	1.739	2.287	3.131	3.460	3.541	3.127	2.682	5.29%	4.23%	-1.68%
World	**104.006**	**120.194**	**127.814**	**140.678**	**153.341**	**162.045**	**169.635**	**174.106**	**2.08%**	**1.84%**	**0.85%**

LNG12_HRR Case (Supply)(tcf)

	2005	2010	2015	2020	2025	2030	2035	2040	cagr 2005-15	cagr 2015-25	cagr 2025-40
North America	**27.461**	**30.089**	**35.126**	**40.248**	**42.425**	**44.745**	**48.465**	**50.357**	**2.49%**	**1.91%**	**1.15%**
Canada	7.185	5.909	5.709	6.666	7.988	8.597	9.205	9.310	-2.27%	3.42%	1.03%
Mexico	1.349	1.799	1.251	0.660	0.868	1.198	2.710	3.841	-0.75%	-3.60%	10.43%
United States	18.927	22.382	28.166	32.923	33.569	34.951	36.550	37.206	4.06%	1.77%	0.69%
Central & South America	**5.318**	**6.267**	**6.532**	**6.816**	**7.735**	**8.324**	**8.740**	**9.125**	**2.08%**	**1.71%**	**1.11%**
Argentina	1.753	1.585	1.386	2.484	3.121	3.559	3.855	4.102	-2.32%	8.46%	1.84%
Brazil	0.432	0.570	0.762	0.338	0.157	0.097	0.048	0.023	5.84%	-14.63%	-11.96%
Chile	0.068	0.065	0.025	0.011	0.005	0.002	0.050	0.076	-9.34%	-15.00%	19.84%
Colombia	0.253	0.454	0.502	0.427	0.315	0.223	0.205	0.307	7.08%	-4.56%	-0.17%
Peru	0.073	0.291	0.441	0.459	0.491	0.512	0.546	0.599	19.64%	1.06%	1.34%
Trinidad and Tobago	1.094	1.512	1.465	1.359	1.565	1.561	1.543	1.526	2.97%	0.66%	-0.17%
Venezuela	1.172	1.201	1.253	1.223	1.548	1.800	1.884	1.882	0.66%	2.14%	1.31%
Other Central & South America	0.472	0.589	0.696	0.514	0.534	0.571	0.609	0.610	3.96%	-2.61%	0.89%
Europe	**11.723**	**11.155**	**9.782**	**9.970**	**10.132**	**9.332**	**8.444**	**7.395**	**-1.79%**	**0.35%**	**-2.08%**
Austria	0.061	0.064	0.041	0.029	0.031	0.019	0.011	0.007	-3.85%	-2.81%	-9.36%
Belgium	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	---	---	---
France	0.063	0.048	0.013	0.006	0.011	0.018	0.012	0.032	-14.41%	-2.01%	7.35%
Germany	0.689	0.526	0.329	0.168	0.229	0.429	0.585	0.453	-7.11%	-3.58%	4.66%
Italy	0.426	0.297	0.239	0.143	0.237	0.234	0.148	0.097	-5.63%	-0.09%	-5.77%
Netherlands	2.773	3.131	3.133	2.900	2.375	1.571	0.911	0.566	1.23%	-2.73%	-9.12%
Norway	3.196	3.849	3.742	4.125	4.415	4.270	3.962	3.735	1.59%	1.67%	-1.11%
Poland	0.214	0.215	0.182	0.152	0.091	0.052	0.078	0.116	-1.61%	-6.73%	1.64%
Portugal	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	---	---	---
Romania	0.413	0.374	0.357	0.458	0.458	0.371	0.361	0.297	-1.45%	2.52%	-2.85%
Spain	0.006	0.002	0.001	0.001	0.007	0.012	0.033	0.179	-13.54%	17.83%	24.02%
Turkey	0.032	0.024	0.057	0.155	0.151	0.150	0.071	0.027	5.98%	10.28%	-10.78%
United Kingdom	3.275	2.124	1.306	1.446	1.721	1.808	1.921	1.624	-8.78%	2.79%	-0.39%
Other Europe	0.574	0.502	0.381	0.389	0.408	0.399	0.351	0.263	-4.02%	0.67%	-2.88%
Eurasia	**27.386**	**27.903**	**28.430**	**30.434**	**33.563**	**35.486**	**36.576**	**37.714**	**0.37%**	**1.67%**	**0.78%**
Kazakhstan	0.428	0.441	0.630	1.065	1.417	1.516	1.569	1.693	3.94%	8.44%	1.20%
Russia	21.698	22.372	21.625	22.336	24.135	25.415	26.205	26.924	-0.03%	1.10%	0.73%
Turkmenistan	2.225	1.600	2.564	3.174	3.864	4.550	5.422	6.286	1.43%	4.19%	3.30%
Ukraine	0.685	0.684	0.604	0.296	0.428	0.758	0.963	0.984	-1.25%	-3.40%	5.72%
Uzbekistan	2.119	2.130	2.450	3.144	3.144	2.520	1.661	1.070	1.47%	2.52%	-6.94%
Other Eurasia	0.232	0.677	0.557	0.419	0.576	0.728	0.756	0.756	9.13%	0.35%	1.83%
Middle East	**12.334**	**18.699**	**21.346**	**22.494**	**24.172**	**25.782**	**27.212**	**28.512**	**5.64%**	**1.25%**	**1.11%**
Iran	3.818	6.031	6.405	6.720	7.112	7.469	7.742	8.080	5.31%	1.05%	0.85%
Qatar	1.826	4.359	5.707	5.935	6.340	6.715	6.747	6.769	12.07%	1.06%	0.44%
Oman	0.748	1.035	1.134	1.227	1.309	1.381	1.425	1.457	4.24%	1.45%	0.72%
Saudi Arabia	2.860	3.424	3.916	4.303	4.847	5.324	5.748	6.198	3.19%	2.16%	1.65%
United Arab Emirates	1.828	1.992	2.005	1.888	1.863	1.922	2.080	2.223	0.93%	-0.73%	1.18%
Other Middle East	1.255	1.858	2.180	2.422	2.701	2.971	3.470	3.786	5.68%	2.16%	2.28%
Africa	**6.877**	**8.553**	**7.414**	**8.187**	**9.986**	**11.245**	**12.625**	**14.171**	**0.75%**	**3.02%**	**2.36%**
Algeria	3.613	3.465	3.429	3.409	3.816	4.063	4.071	3.776	-0.52%	1.08%	-0.07%
Egypt	1.610	2.284	1.748	1.934	2.120	2.106	2.527	3.104	0.82%	1.95%	2.57%
Nigeria	0.862	1.317	1.200	1.135	1.747	1.983	2.383	3.167	3.36%	3.83%	4.05%
Other Africa	0.792	1.486	1.037	1.709	2.302	3.093	3.644	4.124	2.73%	8.30%	3.96%
Asia & Oceania	**12.907**	**17.527**	**19.474**	**23.696**	**26.591**	**29.109**	**30.201**	**29.771**	**4.20%**	**3.16%**	**0.76%**
Australia	1.266	1.708	3.525	5.728	6.136	6.245	6.350	7.057	10.78%	5.70%	0.94%
China	1.763	3.334	3.809	2.897	3.558	4.328	4.667	5.078	8.01%	-0.68%	2.40%
India	1.153	1.848	1.207	1.457	1.668	1.988	2.144	1.598	0.46%	3.29%	-0.29%
Indonesia	2.406	3.047	2.543	3.162	3.760	4.777	6.046	6.860	0.55%	3.99%	4.09%
Japan	0.191	0.171	0.079	0.024	0.025	0.015	0.008	0.004	-8.47%	-10.67%	-11.04%
Malaysia	2.147	2.347	2.642	3.598	4.024	4.182	3.662	3.066	2.10%	4.30%	-1.80%
Myanmar	0.479	0.437	0.415	0.541	0.615	0.911	1.414	1.395	-1.42%	4.01%	5.62%
Pakistan	1.194	1.484	1.431	1.779	2.138	2.269	1.819	1.247	1.83%	4.10%	-3.53%
Singapore	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	---	---	---
South Korea	0.017	0.033	0.014	0.005	0.005	0.002	0.001	0.000	-1.95%	-9.82%	-15.00%
Thailand	0.925	1.378	1.522	1.365	1.193	0.828	1.002	0.868	5.10%	-2.41%	-2.10%
Other Asia & Oceania	1.366	1.739	2.288	3.141	3.470	3.564	3.088	2.597	5.30%	4.25%	-1.91%
World	**104.006**	**120.194**	**128.104**	**141.846**	**154.603**	**164.024**	**172.264**	**177.044**	**2.11%**	**1.90%**	**0.91%**

LNG12_LRR Case (Supply)(tcf)

	2005	2010	2015	2020	2025	2030	2035	2040	cagr 2005-15	cagr 2015-25	cagr 2025-40
North America	**27.461**	**30.089**	**34.743**	**38.822**	**41.484**	**41.940**	**43.279**	**44.643**	**2.38%**	**1.79%**	**0.49%**
Canada	7.185	5.909	6.081	8.021	8.717	8.912	9.284	9.351	-1.65%	3.67%	0.47%
Mexico	1.349	1.799	1.251	0.752	1.472	2.770	4.437	5.827	-0.74%	1.64%	9.61%
United States	18.927	22.382	27.411	30.050	31.294	30.257	29.557	29.464	3.77%	1.33%	-0.40%
Central & South America	**5.318**	**6.267**	**6.531**	**6.853**	**7.723**	**8.314**	**8.743**	**9.133**	**2.08%**	**1.69%**	**1.12%**
Argentina	1.753	1.585	1.386	2.483	3.113	3.554	3.855	4.095	-2.32%	8.42%	1.84%
Brazil	0.432	0.570	0.762	0.338	0.157	0.097	0.048	0.023	5.84%	-14.64%	-11.88%
Chile	0.068	0.065	0.025	0.011	0.005	0.002	0.051	0.075	-9.34%	-15.00%	19.81%
Colombia	0.253	0.454	0.502	0.427	0.314	0.223	0.198	0.314	7.08%	-4.57%	-0.02%
Peru	0.073	0.291	0.441	0.454	0.486	0.512	0.569	0.600	19.63%	0.98%	1.41%
Trinidad and Tobago	1.094	1.512	1.464	1.395	1.564	1.560	1.547	1.521	2.96%	0.66%	-0.18%
Venezuela	1.172	1.201	1.253	1.225	1.550	1.800	1.908	1.869	0.66%	2.15%	1.26%
Other Central & South America	0.472	0.589	0.697	0.519	0.535	0.566	0.568	0.636	3.97%	-2.61%	1.16%
Europe	**11.723**	**11.155**	**9.776**	**10.063**	**10.152**	**9.357**	**8.477**	**7.426**	**-1.80%**	**0.38%**	**-2.06%**
Austria	0.061	0.064	0.041	0.031	0.031	0.018	0.011	0.007	-3.85%	-2.79%	-9.42%
Belgium	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	---	---	---
France	0.063	0.048	0.013	0.006	0.011	0.018	0.012	0.028	-14.42%	-1.74%	6.28%
Germany	0.689	0.526	0.329	0.174	0.229	0.435	0.590	0.452	-7.12%	-3.55%	4.63%
Italy	0.426	0.297	0.239	0.151	0.239	0.232	0.146	0.096	-5.63%	0.03%	-5.89%
Netherlands	2.773	3.131	3.128	2.905	2.378	1.577	0.912	0.568	1.21%	-2.71%	-9.11%
Norway	3.196	3.849	3.743	4.156	4.404	4.272	4.017	3.771	1.59%	1.64%	-1.03%
Poland	0.214	0.215	0.181	0.152	0.091	0.053	0.081	0.118	-1.68%	-6.65%	1.74%
Portugal	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	---	---	---
Romania	0.413	0.374	0.359	0.469	0.458	0.372	0.359	0.293	-1.39%	2.44%	-2.93%
Spain	0.006	0.002	0.001	0.001	0.006	0.012	0.043	0.184	-13.54%	15.68%	25.75%
Turkey	0.032	0.024	0.056	0.155	0.159	0.148	0.067	0.022	5.86%	11.01%	-12.26%
United Kingdom	3.275	2.124	1.307	1.467	1.742	1.815	1.894	1.626	-8.78%	2.91%	-0.46%
Other Europe	0.574	0.502	0.378	0.398	0.403	0.405	0.346	0.261	-4.10%	0.66%	-2.85%
Eurasia	**27.386**	**27.903**	**28.444**	**30.514**	**33.562**	**35.528**	**36.715**	**37.641**	**0.38%**	**1.67%**	**0.77%**
Kazakhstan	0.428	0.441	0.630	1.068	1.421	1.519	1.579	1.695	3.94%	8.48%	1.18%
Russia	21.698	22.372	21.628	22.389	24.189	25.457	26.300	26.835	-0.03%	1.13%	0.69%
Turkmenistan	2.225	1.600	2.573	3.200	3.851	4.550	5.419	6.288	1.46%	4.11%	3.32%
Ukraine	0.685	0.684	0.604	0.296	0.407	0.749	0.960	0.994	-1.25%	-3.88%	6.14%
Uzbekistan	2.119	2.130	2.454	3.152	3.152	2.517	1.660	1.064	1.48%	2.54%	-6.98%
Other Eurasia	0.232	0.677	0.556	0.409	0.542	0.736	0.798	0.765	9.12%	-0.26%	2.33%
Middle East	**12.334**	**18.699**	**21.349**	**22.504**	**24.172**	**25.810**	**27.289**	**28.631**	**5.64%**	**1.25%**	**1.13%**
Iran	3.818	6.031	6.405	6.725	7.113	7.477	7.746	8.040	5.31%	1.05%	0.82%
Qatar	1.826	4.359	5.705	5.931	6.347	6.718	6.754	6.777	12.07%	1.07%	0.44%
Oman	0.748	1.035	1.134	1.227	1.311	1.383	1.422	1.454	4.24%	1.46%	0.69%
Saudi Arabia	2.860	3.424	3.916	4.304	4.847	5.327	5.752	6.216	3.19%	2.16%	1.67%
United Arab Emirates	1.828	1.992	2.007	1.892	1.862	1.927	2.084	2.192	0.94%	-0.75%	1.10%
Other Middle East	1.255	1.858	2.184	2.424	2.692	2.979	3.531	3.951	5.70%	2.12%	2.59%
Africa	**6.877**	**8.553**	**7.415**	**8.301**	**9.972**	**11.234**	**13.054**	**14.880**	**0.76%**	**3.01%**	**2.70%**
Algeria	3.613	3.465	3.429	3.480	3.825	4.076	4.232	3.868	-0.52%	1.10%	0.07%
Egypt	1.610	2.284	1.748	1.931	2.088	2.093	2.556	3.117	0.83%	1.79%	2.71%
Nigeria	0.862	1.317	1.202	1.172	1.744	1.981	2.553	3.544	3.39%	3.79%	4.84%
Other Africa	0.792	1.486	1.036	1.719	2.314	3.084	3.713	4.352	2.72%	8.37%	4.30%
Asia & Oceania	**12.907**	**17.527**	**19.468**	**23.923**	**26.543**	**29.869**	**32.052**	**32.072**	**4.20%**	**3.15%**	**1.27%**
Australia	1.266	1.708	3.527	5.914	6.141	6.249	6.652	7.571	10.79%	5.70%	1.41%
China	1.763	3.334	3.799	2.913	3.532	4.650	5.517	6.083	7.98%	-0.73%	3.69%
India	1.153	1.848	1.204	1.453	1.648	2.063	2.200	1.719	0.43%	3.19%	0.28%
Indonesia	2.406	3.047	2.552	3.184	3.773	4.938	6.265	7.163	0.59%	3.99%	4.37%
Japan	0.191	0.171	0.076	0.028	0.025	0.016	0.008	0.005	-8.79%	-10.49%	-10.62%
Malaysia	2.147	2.347	2.643	3.579	4.007	4.252	3.772	3.167	2.10%	4.25%	-1.56%
Myanmar	0.479	0.437	0.415	0.541	0.616	0.933	1.468	1.399	-1.41%	4.02%	5.63%
Pakistan	1.194	1.484	1.430	1.777	2.122	2.295	1.899	1.255	1.83%	4.02%	-3.44%
Singapore	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	---	---	---
South Korea	0.017	0.033	0.014	0.005	0.005	0.002	0.001	0.000	-1.91%	-9.86%	-15.00%
Thailand	0.925	1.378	1.521	1.367	1.190	0.829	1.015	0.871	5.09%	-2.42%	-2.06%
Other Asia & Oceania	1.366	1.739	2.286	3.161	3.485	3.641	3.255	2.839	5.29%	4.30%	-1.36%
World	**104.006**	**120.194**	**127.727**	**140.981**	**153.608**	**162.052**	**169.610**	**174.425**	**2.08%**	**1.86%**	**0.85%**

LNG12_Hi-D Case (Supply)(tcf)

	2005	2010	2015	2020	2025	2030	2035	2040	cagr 2005-15	cagr 2015-25	cagr 2025-40
North America	**27.461**	**30.089**	**35.045**	**40.313**	**43.665**	**45.369**	**47.514**	**48.845**	**2.47%**	**2.22%**	**0.75%**
Canada	7.185	5.909	5.929	7.715	8.687	8.893	9.284	9.340	-1.90%	3.89%	0.48%
Mexico	1.349	1.799	1.251	0.718	1.021	2.240	3.628	5.419	-0.74%	-2.01%	11.77%
United States	18.927	22.382	27.864	31.880	33.957	34.236	34.602	34.086	3.94%	2.00%	0.03%
Central & South America	**5.318**	**6.267**	**6.529**	**6.828**	**7.726**	**8.336**	**8.795**	**9.116**	**2.07%**	**1.70%**	**1.11%**
Argentina	1.753	1.585	1.386	2.485	3.114	3.558	3.856	4.114	-2.32%	8.43%	1.87%
Brazil	0.432	0.570	0.762	0.338	0.157	0.096	0.048	0.024	5.84%	-14.61%	-11.89%
Chile	0.068	0.065	0.025	0.011	0.005	0.002	0.051	0.075	-9.34%	-15.00%	19.80%
Colombia	0.253	0.454	0.502	0.427	0.315	0.223	0.199	0.300	7.08%	-4.56%	-0.31%
Peru	0.073	0.291	0.442	0.454	0.490	0.516	0.573	0.591	19.65%	1.05%	1.25%
Trinidad and Tobago	1.094	1.512	1.464	1.373	1.568	1.561	1.549	1.518	2.96%	0.69%	-0.22%
Venezuela	1.172	1.201	1.253	1.225	1.547	1.809	1.908	1.880	0.66%	2.13%	1.31%
Other Central & South America	0.472	0.589	0.695	0.514	0.530	0.571	0.610	0.614	3.94%	-2.68%	0.99%
Europe	**11.723**	**11.155**	**9.777**	**10.029**	**10.150**	**9.358**	**8.511**	**7.413**	**-1.80%**	**0.37%**	**-2.07%**
Austria	0.061	0.064	0.042	0.031	0.031	0.018	0.011	0.007	-3.72%	-2.90%	-9.37%
Belgium	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	---	---	---
France	0.063	0.048	0.013	0.006	0.012	0.018	0.012	0.029	-14.42%	-0.89%	5.98%
Germany	0.689	0.526	0.329	0.173	0.233	0.433	0.590	0.458	-7.11%	-3.42%	4.61%
Italy	0.426	0.297	0.239	0.144	0.233	0.235	0.153	0.097	-5.63%	-0.22%	-5.69%
Netherlands	2.773	3.131	3.133	2.909	2.371	1.564	0.920	0.557	1.23%	-2.75%	-9.21%
Norway	3.196	3.849	3.742	4.149	4.428	4.274	3.986	3.786	1.59%	1.70%	-1.04%
Poland	0.214	0.215	0.180	0.152	0.091	0.055	0.088	0.114	-1.73%	-6.55%	1.52%
Portugal	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	---	---	---
Romania	0.413	0.374	0.357	0.463	0.457	0.376	0.367	0.285	-1.44%	2.48%	-3.09%
Spain	0.006	0.002	0.001	0.001	0.007	0.012	0.041	0.175	-13.55%	17.64%	23.98%
Turkey	0.032	0.024	0.056	0.143	0.157	0.150	0.069	0.025	5.91%	10.78%	-11.53%
United Kingdom	3.275	2.124	1.307	1.461	1.725	1.819	1.927	1.618	-8.78%	2.81%	-0.43%
Other Europe	0.574	0.502	0.378	0.398	0.405	0.404	0.346	0.261	-4.10%	0.69%	-2.88%
Eurasia	**27.386**	**27.903**	**28.439**	**30.505**	**33.515**	**35.486**	**36.595**	**37.519**	**0.38%**	**1.66%**	**0.76%**
Kazakhstan	0.428	0.441	0.631	1.056	1.400	1.534	1.616	1.715	3.95%	8.30%	1.36%
Russia	21.698	22.372	21.634	22.407	24.153	25.446	26.246	26.757	-0.03%	1.11%	0.68%
Turkmenistan	2.225	1.600	2.564	3.183	3.824	4.469	5.367	6.228	1.43%	4.08%	3.31%
Ukraine	0.685	0.684	0.604	0.298	0.428	0.771	0.946	0.991	-1.25%	-3.38%	5.75%
Uzbekistan	2.119	2.130	2.449	3.144	3.149	2.520	1.653	1.065	1.46%	2.55%	-6.98%
Other Eurasia	0.232	0.677	0.557	0.416	0.561	0.746	0.769	0.763	9.13%	0.09%	2.07%
Middle East	**12.334**	**18.699**	**21.354**	**22.502**	**24.166**	**25.815**	**27.278**	**28.652**	**5.64%**	**1.24%**	**1.14%**
Iran	3.818	6.031	6.408	6.726	7.111	7.472	7.744	8.062	5.32%	1.05%	0.84%
Qatar	1.826	4.359	5.704	5.930	6.349	6.717	6.754	6.767	12.07%	1.08%	0.43%
Oman	0.748	1.035	1.134	1.227	1.309	1.383	1.424	1.452	4.25%	1.44%	0.70%
Saudi Arabia	2.860	3.424	3.916	4.303	4.849	5.323	5.745	6.197	3.19%	2.16%	1.65%
United Arab Emirates	1.828	1.992	2.007	1.893	1.860	1.927	2.077	2.218	0.94%	-0.75%	1.18%
Other Middle East	1.255	1.858	2.185	2.422	2.689	2.992	3.533	3.958	5.71%	2.09%	2.61%
Africa	**6.877**	**8.553**	**7.410**	**8.253**	**9.975**	**11.222**	**12.869**	**14.620**	**0.75%**	**3.02%**	**2.58%**
Algeria	3.613	3.465	3.429	3.454	3.827	4.072	4.155	3.837	-0.52%	1.11%	0.02%
Egypt	1.610	2.284	1.750	1.932	2.082	2.085	2.554	3.123	0.84%	1.75%	2.74%
Nigeria	0.862	1.317	1.195	1.149	1.753	1.968	2.493	3.344	3.33%	3.90%	4.40%
Other Africa	0.792	1.486	1.036	1.717	2.312	3.097	3.666	4.315	2.72%	8.36%	4.25%
Asia & Oceania	**12.907**	**17.527**	**19.475**	**23.869**	**26.605**	**29.693**	**31.504**	**31.505**	**4.20%**	**3.17%**	**1.13%**
Australia	1.266	1.708	3.527	5.874	6.167	6.223	6.501	7.380	10.79%	5.75%	1.20%
China	1.763	3.334	3.803	2.902	3.544	4.558	5.282	5.849	7.99%	-0.70%	3.40%
India	1.153	1.848	1.208	1.453	1.655	2.049	2.170	1.695	0.47%	3.20%	0.16%
Indonesia	2.406	3.047	2.549	3.185	3.775	4.910	6.241	7.137	0.58%	4.01%	4.34%
Japan	0.191	0.171	0.078	0.027	0.025	0.016	0.008	0.005	-8.60%	-10.54%	-10.86%
Malaysia	2.147	2.347	2.644	3.583	4.012	4.266	3.767	3.128	2.10%	4.26%	-1.65%
Myanmar	0.479	0.437	0.415	0.541	0.617	0.925	1.452	1.410	-1.41%	4.05%	5.66%
Pakistan	1.194	1.484	1.430	1.778	2.136	2.302	1.867	1.248	1.83%	4.09%	-3.52%
Singapore	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	---	---	---
South Korea	0.017	0.033	0.014	0.005	0.005	0.002	0.001	0.000	-1.89%	-9.87%	-15.00%
Thailand	0.925	1.378	1.521	1.362	1.189	0.836	1.011	0.870	5.10%	-2.43%	-2.06%
Other Asia & Oceania	1.366	1.739	2.287	3.160	3.479	3.606	3.204	2.782	5.29%	4.28%	-1.48%
World	**104.006**	**120.194**	**128.030**	**142.299**	**155.802**	**165.280**	**173.066**	**177.670**	**2.10%**	**1.98%**	**0.88%**

LNG20_Ref Case (Supply)(tcf)

	2005	2010	2015	2020	2025	2030	2035	2040	cagr 2005-15	cagr 2015-25	cagr 2025-40
North America	**27.461**	**30.089**	**34.905**	**39.796**	**42.056**	**45.244**	**48.634**	**50.802**	**2.43%**	**1.88%**	**1.27%**
Canada	7.185	5.909	5.902	7.642	8.632	8.778	8.852	8.901	-1.95%	3.87%	0.20%
Mexico	1.349	1.799	1.251	0.715	1.028	2.471	3.989	5.064	-0.74%	-1.95%	11.22%
United States	18.927	22.382	27.751	31.440	32.396	33.994	35.793	36.837	3.90%	1.56%	0.86%
Central & South America	**5.318**	**6.267**	**6.548**	**6.937**	**7.748**	**8.347**	**8.849**	**9.081**	**2.10%**	**1.70%**	**1.06%**
Argentina	1.753	1.585	1.386	2.485	3.115	3.557	3.856	4.098	-2.32%	8.43%	1.85%
Brazil	0.432	0.570	0.762	0.338	0.158	0.097	0.048	0.023	5.84%	-14.59%	-12.01%
Chile	0.068	0.065	0.025	0.011	0.005	0.002	0.051	0.075	-9.34%	-15.00%	19.76%
Colombia	0.253	0.454	0.502	0.427	0.315	0.223	0.199	0.296	7.08%	-4.55%	-0.42%
Peru	0.073	0.291	0.442	0.454	0.485	0.537	0.575	0.584	19.66%	0.93%	1.24%
Trinidad and Tobago	1.094	1.512	1.481	1.474	1.570	1.560	1.586	1.566	3.08%	0.58%	-0.02%
Venezuela	1.172	1.201	1.253	1.220	1.551	1.808	1.908	1.823	0.66%	2.16%	1.08%
Other Central & South America	0.472	0.589	0.696	0.527	0.549	0.563	0.626	0.617	3.95%	-2.34%	0.78%
Europe	**11.723**	**11.155**	**9.768**	**10.014**	**10.025**	**9.129**	**8.340**	**7.346**	**-1.81%**	**0.26%**	**-2.05%**
Austria	0.061	0.064	0.041	0.032	0.030	0.017	0.011	0.007	-3.88%	-3.19%	-9.42%
Belgium	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	---	---	---
France	0.063	0.048	0.013	0.006	0.013	0.017	0.011	0.032	-14.43%	-0.02%	6.12%
Germany	0.689	0.526	0.329	0.176	0.228	0.428	0.579	0.452	-7.12%	-3.62%	4.68%
Italy	0.426	0.297	0.239	0.159	0.247	0.226	0.144	0.123	-5.63%	0.35%	-4.53%
Netherlands	2.773	3.131	3.133	2.934	2.377	1.550	0.900	0.556	1.23%	-2.72%	-9.23%
Norway	3.196	3.849	3.735	4.150	4.430	4.253	3.979	3.723	1.57%	1.72%	-1.15%
Poland	0.214	0.215	0.183	0.149	0.090	0.050	0.070	0.116	-1.56%	-6.83%	1.69%
Portugal	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	---	---	---
Romania	0.413	0.374	0.362	0.477	0.451	0.360	0.355	0.298	-1.32%	2.24%	-2.73%
Spain	0.006	0.002	0.001	0.001	0.006	0.012	0.043	0.189	-13.56%	16.60%	25.35%
Turkey	0.032	0.024	0.049	0.047	0.029	0.018	0.011	0.008	4.36%	-4.96%	-8.62%
United Kingdom	3.275	2.124	1.311	1.482	1.723	1.797	1.887	1.581	-8.75%	2.78%	-0.57%
Other Europe	0.574	0.502	0.372	0.403	0.399	0.400	0.349	0.261	-4.25%	0.71%	-2.78%
Eurasia	**27.386**	**27.903**	**28.483**	**29.336**	**31.965**	**33.572**	**34.578**	**35.391**	**0.39%**	**1.16%**	**0.68%**
Kazakhstan	0.428	0.441	0.629	1.012	1.363	1.470	1.534	1.654	3.94%	8.03%	1.30%
Russia	21.698	22.372	21.665	21.336	22.714	23.747	24.396	24.720	-0.01%	0.47%	0.57%
Turkmenistan	2.225	1.600	2.571	3.148	3.760	4.358	5.283	6.152	1.46%	3.87%	3.34%
Ukraine	0.685	0.684	0.604	0.300	0.418	0.746	0.937	1.023	-1.25%	-3.63%	6.16%
Uzbekistan	2.119	2.130	2.454	3.121	3.121	2.520	1.668	1.083	1.48%	2.43%	-6.82%
Other Eurasia	0.232	0.677	0.558	0.419	0.589	0.732	0.760	0.759	9.16%	0.54%	1.70%
Middle East	**12.334**	**18.699**	**21.347**	**22.516**	**24.347**	**25.802**	**27.199**	**28.714**	**5.64%**	**1.32%**	**1.11%**
Iran	3.818	6.031	6.406	6.725	7.114	7.468	7.744	8.062	5.31%	1.05%	0.84%
Qatar	1.826	4.359	5.706	5.935	6.458	6.719	6.753	6.783	12.07%	1.25%	0.33%
Oman	0.748	1.035	1.134	1.228	1.333	1.384	1.422	1.455	4.25%	1.63%	0.59%
Saudi Arabia	2.860	3.424	3.916	4.304	4.848	5.326	5.745	6.193	3.19%	2.16%	1.65%
United Arab Emirates	1.828	1.992	2.005	1.889	1.885	1.923	2.089	2.215	0.93%	-0.62%	1.08%
Other Middle East	1.255	1.858	2.181	2.436	2.709	2.983	3.447	4.006	5.68%	2.19%	2.64%
Africa	**6.877**	**8.553**	**7.435**	**8.501**	**10.013**	**11.321**	**13.067**	**14.403**	**0.78%**	**3.02%**	**2.45%**
Algeria	3.613	3.465	3.429	3.527	3.841	4.123	4.296	3.924	-0.52%	1.14%	0.14%
Egypt	1.610	2.284	1.748	1.932	2.101	2.070	2.443	2.953	0.82%	1.86%	2.29%
Nigeria	0.862	1.317	1.225	1.308	1.757	2.015	2.677	3.644	3.58%	3.67%	4.99%
Other Africa	0.792	1.486	1.034	1.734	2.315	3.114	3.651	3.882	2.70%	8.40%	3.51%
Asia & Oceania	**12.907**	**17.527**	**19.384**	**24.767**	**28.242**	**30.475**	**31.606**	**30.980**	**4.15%**	**3.84%**	**0.62%**
Australia	1.266	1.708	3.520	6.008	6.158	6.254	6.545	6.688	10.77%	5.75%	0.55%
China	1.763	3.334	3.746	3.363	4.553	5.062	5.724	6.018	7.83%	1.97%	1.88%
India	1.153	1.848	1.185	1.493	1.827	1.886	1.658	1.275	0.28%	4.42%	-2.37%
Indonesia	2.406	3.047	2.547	3.245	3.887	5.063	6.683	7.927	0.57%	4.32%	4.87%
Japan	0.191	0.171	0.076	0.028	0.032	0.015	0.008	0.005	-8.73%	-8.35%	-11.66%
Malaysia	2.147	2.347	2.643	3.600	4.094	4.356	3.957	3.281	2.10%	4.47%	-1.46%
Myanmar	0.479	0.437	0.413	0.541	0.649	1.078	1.523	1.367	-1.45%	4.60%	5.10%
Pakistan	1.194	1.484	1.430	1.777	2.126	2.319	1.917	1.303	1.83%	4.04%	-3.21%
Singapore	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	---	---	---
South Korea	0.017	0.033	0.015	0.006	0.005	0.002	0.001	0.000	-1.72%	-10.02%	-15.00%
Thailand	0.925	1.378	1.518	1.402	1.225	0.813	0.586	0.466	5.08%	-2.12%	-6.23%
Other Asia & Oceania	1.366	1.739	2.289	3.304	3.687	3.627	3.004	2.649	5.30%	4.88%	-2.18%
World	**104.006**	**120.194**	**127.870**	**141.867**	**154.396**	**163.890**	**172.272**	**176.718**	**2.09%**	**1.90%**	**0.90%**

LNG20_HRR Case (Supply)(tcf)

	2005	2010	2015	2020	2025	2030	2035	2040	cagr 2005-15	cagr 2015-25	cagr 2025-40
North America	**27.461**	**30.089**	**35.081**	**40.285**	**42.830**	**46.809**	**51.418**	**54.257**	**2.48%**	**2.02%**	**1.59%**
Canada	7.185	5.909	5.710	6.752	8.096	8.650	8.841	8.899	-2.27%	3.55%	0.63%
Mexico	1.349	1.799	1.251	0.668	0.864	1.511	2.959	4.296	-0.75%	-3.63%	11.28%
United States	18.927	22.382	28.119	32.865	33.869	36.648	39.619	41.062	4.04%	1.88%	1.29%
Central & South America	**5.318**	**6.267**	**6.532**	**6.913**	**7.749**	**8.327**	**8.774**	**9.138**	**2.08%**	**1.72%**	**1.11%**
Argentina	1.753	1.585	1.386	2.484	3.114	3.551	3.854	4.118	-2.32%	8.43%	1.88%
Brazil	0.432	0.570	0.762	0.338	0.155	0.096	0.047	0.023	5.84%	-14.74%	-11.83%
Chile	0.068	0.065	0.025	0.011	0.005	0.002	0.050	0.075	-9.34%	-15.00%	19.79%
Colombia	0.253	0.454	0.502	0.427	0.315	0.224	0.197	0.292	7.08%	-4.55%	-0.50%
Peru	0.073	0.291	0.442	0.456	0.488	0.521	0.575	0.592	19.65%	1.01%	1.30%
Trinidad and Tobago	1.094	1.512	1.465	1.447	1.569	1.559	1.547	1.521	2.96%	0.69%	-0.21%
Venezuela	1.172	1.201	1.253	1.223	1.547	1.799	1.901	1.902	0.66%	2.13%	1.39%
Other Central & South America	0.472	0.589	0.696	0.526	0.555	0.574	0.604	0.614	3.96%	-2.23%	0.67%
Europe	**11.723**	**11.155**	**9.769**	**10.026**	**10.025**	**9.138**	**8.319**	**7.381**	**-1.81%**	**0.26%**	**-2.02%**
Austria	0.061	0.064	0.041	0.031	0.030	0.018	0.011	0.007	-3.86%	-3.06%	-9.33%
Belgium	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	---	---	---
France	0.063	0.048	0.013	0.006	0.012	0.018	0.012	0.026	-14.43%	-1.16%	5.44%
Germany	0.689	0.526	0.329	0.174	0.230	0.419	0.581	0.454	-7.12%	-3.54%	4.65%
Italy	0.426	0.297	0.239	0.159	0.246	0.226	0.144	0.120	-5.63%	0.30%	-4.69%
Netherlands	2.773	3.131	3.127	2.918	2.373	1.566	0.902	0.558	1.21%	-2.72%	-9.20%
Norway	3.196	3.849	3.743	4.193	4.419	4.264	3.954	3.764	1.59%	1.68%	-1.06%
Poland	0.214	0.215	0.182	0.150	0.091	0.050	0.072	0.117	-1.58%	-6.77%	1.71%
Portugal	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	---	---	---
Romania	0.413	0.374	0.362	0.474	0.453	0.361	0.358	0.291	-1.32%	2.26%	-2.89%
Spain	0.006	0.002	0.001	0.001	0.006	0.012	0.040	0.179	-13.55%	16.02%	25.28%
Turkey	0.032	0.024	0.048	0.048	0.029	0.018	0.011	0.007	4.32%	-4.95%	-9.03%
United Kingdom	3.275	2.124	1.308	1.463	1.734	1.791	1.891	1.599	-8.77%	2.86%	-0.54%
Other Europe	0.574	0.502	0.375	0.409	0.403	0.396	0.342	0.259	-4.18%	0.72%	-2.91%
Eurasia	**27.386**	**27.903**	**28.487**	**29.318**	**31.955**	**33.579**	**34.539**	**35.284**	**0.39%**	**1.16%**	**0.66%**
Kazakhstan	0.428	0.441	0.632	1.012	1.360	1.473	1.524	1.611	3.98%	7.96%	1.13%
Russia	21.698	22.372	21.661	21.321	22.688	23.710	24.413	24.712	-0.02%	0.46%	0.57%
Turkmenistan	2.225	1.600	2.572	3.157	3.803	4.412	5.239	6.089	1.46%	3.99%	3.19%
Ukraine	0.685	0.684	0.604	0.301	0.425	0.742	0.927	1.003	-1.25%	-3.46%	5.89%
Uzbekistan	2.119	2.130	2.459	3.117	3.117	2.509	1.666	1.090	1.50%	2.40%	-6.77%
Other Eurasia	0.232	0.677	0.558	0.410	0.562	0.732	0.769	0.781	9.16%	0.08%	2.21%
Middle East	**12.334**	**18.699**	**21.348**	**22.513**	**24.328**	**25.792**	**27.223**	**28.598**	**5.64%**	**1.32%**	**1.08%**
Iran	3.818	6.031	6.405	6.721	7.109	7.469	7.748	8.055	5.31%	1.05%	0.84%
Qatar	1.826	4.359	5.706	5.936	6.454	6.719	6.754	6.771	12.07%	1.24%	0.32%
Oman	0.748	1.035	1.134	1.227	1.333	1.383	1.427	1.454	4.24%	1.63%	0.58%
Saudi Arabia	2.860	3.424	3.917	4.303	4.846	5.323	5.748	6.200	3.19%	2.15%	1.66%
United Arab Emirates	1.828	1.992	2.006	1.888	1.878	1.926	2.083	2.204	0.93%	-0.65%	1.07%
Other Middle East	1.255	1.858	2.181	2.438	2.707	2.974	3.465	3.913	5.69%	2.18%	2.49%
Africa	**6.877**	**8.553**	**7.426**	**8.494**	**10.031**	**11.180**	**12.763**	**14.198**	**0.77%**	**3.05%**	**2.34%**
Algeria	3.613	3.465	3.429	3.527	3.833	4.088	4.198	3.907	-0.52%	1.12%	0.13%
Egypt	1.610	2.284	1.748	1.945	2.134	2.053	2.392	2.919	0.83%	2.02%	2.11%
Nigeria	0.862	1.317	1.216	1.298	1.759	1.979	2.544	3.534	3.50%	3.76%	4.76%
Other Africa	0.792	1.486	1.034	1.724	2.305	3.059	3.629	3.838	2.70%	8.35%	3.46%
Asia & Oceania	**12.907**	**17.527**	**19.398**	**24.812**	**28.085**	**30.049**	**30.665**	**29.934**	**4.16%**	**3.77%**	**0.43%**
Australia	1.266	1.708	3.524	6.002	6.167	6.253	6.495	6.746	10.78%	5.76%	0.60%
China	1.763	3.334	3.743	3.401	4.460	4.744	5.171	5.581	7.82%	1.77%	1.51%
India	1.153	1.848	1.192	1.501	1.842	1.868	1.635	1.214	0.33%	4.45%	-2.74%
Indonesia	2.406	3.047	2.548	3.244	3.873	4.978	6.477	7.502	0.57%	4.27%	4.51%
Japan	0.191	0.171	0.078	0.030	0.031	0.015	0.007	0.005	-8.59%	-8.65%	-12.01%
Malaysia	2.147	2.347	2.644	3.603	4.077	4.372	3.909	3.230	2.10%	4.43%	-1.54%
Myanmar	0.479	0.437	0.414	0.543	0.639	1.074	1.483	1.348	-1.43%	4.43%	5.11%
Pakistan	1.194	1.484	1.430	1.778	2.132	2.311	1.870	1.256	1.83%	4.07%	-3.47%
Singapore	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	---	---	---
South Korea	0.017	0.033	0.015	0.007	0.005	0.002	0.001	0.000	-1.52%	-10.21%	-15.00%
Thailand	0.925	1.378	1.518	1.401	1.230	0.811	0.593	0.460	5.08%	-2.08%	-6.35%
Other Asia & Oceania	1.366	1.739	2.291	3.303	3.628	3.621	3.025	2.592	5.31%	4.70%	-2.22%
World	**104.006**	**120.194**	**128.042**	**142.361**	**155.003**	**164.873**	**173.702**	**178.790**	**2.10%**	**1.93%**	**0.96%**

LNG20_LRR Case (Supply)(tcf)

	2005	2010	2015	2020	2025	2030	2035	2040	cagr 2005-15	cagr 2015-25	cagr 2025-40
North America	**27.461**	**30.089**	**34.678**	**39.266**	**41.430**	**43.593**	**46.194**	**48.019**	**2.36%**	**1.79%**	**0.99%**
Canada	7.185	5.909	6.132	8.136	8.730	8.784	8.864	8.962	-1.57%	3.60%	0.17%
Mexico	1.349	1.799	1.251	0.833	1.633	3.170	4.866	5.053	-0.74%	2.70%	7.82%
United States	18.927	22.382	27.295	30.297	31.067	31.639	32.464	34.004	3.73%	1.30%	0.60%
Central & South America	**5.318**	**6.267**	**6.548**	**6.957**	**7.740**	**8.382**	**8.844**	**9.259**	**2.10%**	**1.69%**	**1.20%**
Argentina	1.753	1.585	1.386	2.486	3.116	3.559	3.855	4.103	-2.32%	8.44%	1.85%
Brazil	0.432	0.570	0.762	0.338	0.157	0.094	0.050	0.023	5.84%	-14.61%	-12.00%
Chile	0.068	0.065	0.025	0.011	0.005	0.002	0.050	0.075	-9.34%	-15.00%	19.82%
Colombia	0.253	0.454	0.502	0.427	0.315	0.224	0.200	0.313	7.08%	-4.55%	-0.04%
Peru	0.073	0.291	0.441	0.453	0.487	0.547	0.577	0.588	19.63%	0.99%	1.26%
Trinidad and Tobago	1.094	1.512	1.483	1.495	1.568	1.574	1.582	1.561	3.09%	0.56%	-0.03%
Venezuela	1.172	1.201	1.253	1.223	1.548	1.799	1.913	1.866	0.66%	2.14%	1.26%
Other Central & South America	0.472	0.589	0.695	0.523	0.545	0.583	0.617	0.730	3.94%	-2.40%	1.96%
Europe	**11.723**	**11.155**	**9.766**	**10.052**	**10.022**	**9.115**	**8.373**	**7.362**	**-1.81%**	**0.26%**	**-2.04%**
Austria	0.061	0.064	0.041	0.031	0.030	0.017	0.011	0.007	-3.83%	-3.16%	-9.46%
Belgium	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	---	---	---
France	0.063	0.048	0.013	0.006	0.012	0.017	0.012	0.031	-14.43%	-0.83%	6.42%
Germany	0.689	0.526	0.329	0.176	0.229	0.425	0.582	0.446	-7.13%	-3.55%	4.55%
Italy	0.426	0.297	0.239	0.162	0.246	0.224	0.145	0.129	-5.63%	0.28%	-4.20%
Netherlands	2.773	3.131	3.130	2.920	2.371	1.554	0.905	0.553	1.22%	-2.74%	-9.25%
Norway	3.196	3.849	3.744	4.203	4.434	4.255	3.983	3.759	1.59%	1.71%	-1.09%
Poland	0.214	0.215	0.182	0.150	0.090	0.050	0.072	0.115	-1.58%	-6.85%	1.66%
Portugal	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	---	---	---
Romania	0.413	0.374	0.359	0.470	0.454	0.356	0.356	0.289	-1.40%	2.39%	-2.97%
Spain	0.006	0.002	0.001	0.001	0.007	0.012	0.046	0.185	-13.56%	17.34%	24.65%
Turkey	0.032	0.024	0.048	0.047	0.029	0.017	0.011	0.007	4.27%	-4.88%	-9.23%
United Kingdom	3.275	2.124	1.304	1.473	1.723	1.792	1.907	1.582	-8.80%	2.83%	-0.57%
Other Europe	0.574	0.502	0.375	0.412	0.397	0.395	0.343	0.258	-4.18%	0.58%	-2.84%
Eurasia	**27.386**	**27.903**	**28.484**	**29.338**	**31.942**	**33.605**	**34.585**	**35.424**	**0.39%**	**1.15%**	**0.69%**
Kazakhstan	0.428	0.441	0.632	1.014	1.364	1.476	1.502	1.653	3.97%	8.00%	1.29%
Russia	21.698	22.372	21.659	21.327	22.706	23.777	24.453	24.821	-0.02%	0.47%	0.60%
Turkmenistan	2.225	1.600	2.572	3.166	3.771	4.362	5.276	6.122	1.46%	3.90%	3.28%
Ukraine	0.685	0.684	0.604	0.299	0.412	0.744	0.938	1.004	-1.25%	-3.75%	6.12%
Uzbekistan	2.119	2.130	2.459	3.117	3.117	2.516	1.671	1.085	1.50%	2.40%	-6.79%
Other Eurasia	0.232	0.677	0.558	0.416	0.573	0.731	0.745	0.737	9.16%	0.26%	1.69%
Middle East	**12.334**	**18.699**	**21.352**	**22.511**	**24.340**	**25.812**	**27.320**	**28.805**	**5.64%**	**1.32%**	**1.13%**
Iran	3.818	6.031	6.406	6.723	7.110	7.476	7.746	8.075	5.31%	1.05%	0.85%
Qatar	1.826	4.359	5.706	5.934	6.468	6.720	6.752	6.790	12.07%	1.26%	0.32%
Oman	0.748	1.035	1.133	1.228	1.331	1.385	1.422	1.450	4.24%	1.62%	0.57%
Saudi Arabia	2.860	3.424	3.916	4.303	4.850	5.330	5.752	6.197	3.19%	2.16%	1.65%
United Arab Emirates	1.828	1.992	2.005	1.890	1.886	1.927	2.092	2.222	0.93%	-0.61%	1.10%
Other Middle East	1.255	1.858	2.185	2.432	2.695	2.974	3.557	4.072	5.70%	2.12%	2.79%
Africa	**6.877**	**8.553**	**7.440**	**8.589**	**10.034**	**11.480**	**13.203**	**14.365**	**0.79%**	**3.04%**	**2.42%**
Algeria	3.613	3.465	3.429	3.570	3.839	4.218	4.392	3.915	-0.52%	1.14%	0.13%
Egypt	1.610	2.284	1.747	1.945	2.138	2.063	2.422	2.940	0.82%	2.04%	2.15%
Nigeria	0.862	1.317	1.230	1.341	1.761	2.027	2.716	3.641	3.62%	3.66%	4.96%
Other Africa	0.792	1.486	1.034	1.733	2.295	3.171	3.672	3.870	2.70%	8.30%	3.54%
Asia & Oceania	**12.907**	**17.527**	**19.381**	**24.799**	**28.334**	**30.965**	**32.457**	**31.775**	**4.15%**	**3.87%**	**0.77%**
Australia	1.266	1.708	3.519	6.043	6.167	6.317	6.576	6.630	10.77%	5.77%	0.48%
China	1.763	3.334	3.747	3.359	4.631	5.403	6.224	6.298	7.83%	2.14%	2.07%
India	1.153	1.848	1.183	1.481	1.797	1.902	1.684	1.318	0.26%	4.27%	-2.05%
Indonesia	2.406	3.047	2.547	3.248	3.890	5.124	6.885	8.304	0.57%	4.33%	5.19%
Japan	0.191	0.171	0.075	0.031	0.032	0.016	0.008	0.005	-8.88%	-8.21%	-11.34%
Malaysia	2.147	2.347	2.643	3.593	4.101	4.366	3.971	3.295	2.10%	4.49%	-1.45%
Myanmar	0.479	0.437	0.413	0.541	0.657	1.090	1.551	1.373	-1.46%	4.75%	5.04%
Pakistan	1.194	1.484	1.430	1.775	2.114	2.311	1.957	1.337	1.82%	3.99%	-3.01%
Singapore	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	---	---	---
South Korea	0.017	0.033	0.014	0.007	0.005	0.002	0.001	0.000	-1.89%	-9.87%	-15.00%
Thailand	0.925	1.378	1.519	1.405	1.227	0.809	0.578	0.479	5.09%	-2.11%	-6.08%
Other Asia & Oceania	1.366	1.739	2.290	3.316	3.713	3.625	3.022	2.736	5.30%	4.95%	-2.02%
World	**104.006**	**120.194**	**127.648**	**141.512**	**153.842**	**162.952**	**170.976**	**175.008**	**2.07%**	**1.88%**	**0.86%**

LNG20_Hi-D Case (Supply)(tcf)

	2005	2010	2015	2020	2025	2030	2035	2040	cagr 2005-15	cagr 2015-25	cagr 2025-40
North America	**27.461**	**30.089**	**35.054**	**40.733**	**43.705**	**47.405**	**50.535**	**52.525**	**2.47%**	**2.23%**	**1.23%**
Canada	7.185	5.909	5.976	7.866	8.709	8.781	8.864	8.943	-1.83%	3.84%	0.18%
Mexico	1.349	1.799	1.251	0.735	1.180	2.722	4.416	5.060	-0.74%	-0.58%	10.19%
United States	18.927	22.382	27.826	32.131	33.816	35.902	37.255	38.523	3.93%	1.97%	0.87%
Central & South America	**5.318**	**6.267**	**6.543**	**6.922**	**7.739**	**8.380**	**8.843**	**9.212**	**2.09%**	**1.69%**	**1.17%**
Argentina	1.753	1.585	1.386	2.484	3.116	3.558	3.857	4.114	-2.32%	8.44%	1.87%
Brazil	0.432	0.570	0.762	0.338	0.157	0.097	0.048	0.024	5.84%	-14.61%	-11.85%
Chile	0.068	0.065	0.025	0.011	0.005	0.002	0.051	0.075	-9.34%	-15.00%	19.78%
Colombia	0.253	0.454	0.502	0.427	0.315	0.223	0.197	0.293	7.08%	-4.56%	-0.49%
Peru	0.073	0.291	0.442	0.453	0.485	0.551	0.575	0.590	19.66%	0.93%	1.31%
Trinidad and Tobago	1.094	1.512	1.477	1.465	1.568	1.560	1.585	1.559	3.04%	0.60%	-0.04%
Venezuela	1.172	1.201	1.253	1.224	1.547	1.811	1.914	1.899	0.66%	2.13%	1.38%
Other Central & South America	0.472	0.589	0.695	0.521	0.546	0.579	0.615	0.658	3.94%	-2.38%	1.25%
Europe	**11.723**	**11.155**	**9.771**	**10.024**	**10.059**	**9.156**	**8.405**	**7.386**	**-1.80%**	**0.29%**	**-2.04%**
Austria	0.061	0.064	0.042	0.033	0.030	0.017	0.011	0.007	-3.77%	-3.21%	-9.49%
Belgium	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	---	---	---
France	0.063	0.048	0.013	0.006	0.014	0.017	0.011	0.032	-14.44%	0.22%	5.95%
Germany	0.689	0.526	0.329	0.177	0.231	0.425	0.585	0.456	-7.11%	-3.50%	4.64%
Italy	0.426	0.297	0.239	0.160	0.247	0.227	0.147	0.121	-5.63%	0.35%	-4.64%
Netherlands	2.773	3.131	3.133	2.930	2.382	1.556	0.912	0.559	1.23%	-2.70%	-9.21%
Norway	3.196	3.849	3.740	4.169	4.437	4.257	3.997	3.744	1.58%	1.72%	-1.13%
Poland	0.214	0.215	0.182	0.151	0.090	0.051	0.074	0.116	-1.58%	-6.80%	1.72%
Portugal	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	---	---	---
Romania	0.413	0.374	0.360	0.473	0.455	0.364	0.365	0.294	-1.36%	2.35%	-2.87%
Spain	0.006	0.002	0.001	0.001	0.006	0.012	0.041	0.182	-13.56%	16.23%	25.29%
Turkey	0.032	0.024	0.049	0.048	0.029	0.018	0.011	0.007	4.52%	-5.12%	-9.03%
United Kingdom	3.275	2.124	1.305	1.473	1.740	1.812	1.903	1.609	-8.79%	2.92%	-0.52%
Other Europe	0.574	0.502	0.377	0.404	0.400	0.401	0.348	0.260	-4.11%	0.59%	-2.84%
Eurasia	**27.386**	**27.903**	**28.485**	**29.347**	**31.950**	**33.550**	**34.530**	**35.445**	**0.39%**	**1.15%**	**0.69%**
Kazakhstan	0.428	0.441	0.631	1.014	1.351	1.459	1.518	1.631	3.96%	7.91%	1.26%
Russia	21.698	22.372	21.663	21.326	22.711	23.729	24.403	24.886	-0.02%	0.47%	0.61%
Turkmenistan	2.225	1.600	2.570	3.175	3.780	4.364	5.263	6.118	1.45%	3.93%	3.26%
Ukraine	0.685	0.684	0.604	0.302	0.417	0.747	0.927	0.963	-1.25%	-3.64%	5.74%
Uzbekistan	2.119	2.130	2.458	3.118	3.118	2.520	1.669	1.080	1.50%	2.41%	-6.82%
Other Eurasia	0.232	0.677	0.558	0.412	0.573	0.731	0.750	0.767	9.16%	0.26%	1.96%
Middle East	**12.334**	**18.699**	**21.348**	**22.511**	**24.349**	**25.807**	**27.242**	**28.733**	**5.64%**	**1.32%**	**1.11%**
Iran	3.818	6.031	6.406	6.726	7.113	7.479	7.751	8.048	5.31%	1.05%	0.83%
Qatar	1.826	4.359	5.704	5.931	6.471	6.719	6.752	6.771	12.07%	1.27%	0.30%
Oman	0.748	1.035	1.134	1.228	1.330	1.385	1.424	1.459	4.24%	1.62%	0.62%
Saudi Arabia	2.860	3.424	3.916	4.304	4.847	5.322	5.755	6.213	3.19%	2.16%	1.67%
United Arab Emirates	1.828	1.992	2.007	1.894	1.879	1.926	2.077	2.218	0.94%	-0.66%	1.11%
Other Middle East	1.255	1.858	2.182	2.429	2.707	2.976	3.483	4.023	5.69%	2.18%	2.68%
Africa	**6.877**	**8.553**	**7.438**	**8.519**	**10.005**	**11.370**	**13.125**	**14.417**	**0.79%**	**3.01%**	**2.47%**
Algeria	3.613	3.465	3.428	3.530	3.838	4.151	4.345	3.927	-0.52%	1.14%	0.15%
Egypt	1.610	2.284	1.748	1.938	2.088	2.064	2.443	2.969	0.83%	1.79%	2.37%
Nigeria	0.862	1.317	1.228	1.318	1.761	2.023	2.675	3.635	3.60%	3.67%	4.95%
Other Africa	0.792	1.486	1.034	1.733	2.318	3.132	3.662	3.886	2.70%	8.41%	3.50%
Asia & Oceania	**12.907**	**17.527**	**19.390**	**24.768**	**28.262**	**30.626**	**31.814**	**31.271**	**4.15%**	**3.84%**	**0.68%**
Australia	1.266	1.708	3.526	6.000	6.157	6.282	6.535	6.660	10.79%	5.73%	0.53%
China	1.763	3.334	3.740	3.365	4.576	5.151	5.813	6.086	7.81%	2.04%	1.92%
India	1.153	1.848	1.187	1.491	1.824	1.894	1.668	1.280	0.29%	4.39%	-2.33%
Indonesia	2.406	3.047	2.550	3.249	3.893	5.095	6.758	8.101	0.58%	4.32%	5.01%
Japan	0.191	0.171	0.077	0.029	0.032	0.015	0.008	0.005	-8.71%	-8.38%	-11.51%
Malaysia	2.147	2.347	2.644	3.596	4.079	4.375	3.957	3.271	2.10%	4.43%	-1.46%
Myanmar	0.479	0.437	0.414	0.541	0.647	1.075	1.543	1.369	-1.45%	4.58%	5.12%
Pakistan	1.194	1.484	1.430	1.776	2.115	2.312	1.931	1.323	1.82%	3.99%	-3.08%
Singapore	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	---	---	---
South Korea	0.017	0.033	0.015	0.006	0.005	0.002	0.001	0.000	-1.73%	-10.02%	-15.00%
Thailand	0.925	1.378	1.517	1.402	1.228	0.812	0.583	0.470	5.07%	-2.09%	-6.20%
Other Asia & Oceania	1.366	1.739	2.291	3.314	3.706	3.612	3.017	2.705	5.31%	4.93%	-2.08%
World	**104.006**	**120.194**	**128.028**	**142.825**	**156.071**	**166.293**	**174.495**	**178.989**	**2.10%**	**2.00%**	**0.92%**

LNG20_Ref12 Case (Supply)(tcf)

	2005	2010	2015	2020	2025	2030	2035	2040	cagr 2005-15	cagr 2015-25	cagr 2025-40
North America	**27.461**	**30.089**	**34.926**	**39.808**	**42.166**	**44.608**	**45.533**	**46.498**	**2.43%**	**1.90%**	**0.65%**
Canada	7.185	5.909	5.884	7.562	8.596	8.775	8.858	8.919	-1.98%	3.86%	0.25%
Mexico	1.349	1.799	1.251	0.711	0.958	2.251	3.467	4.873	-0.74%	-2.63%	11.45%
United States	18.927	22.382	27.791	31.535	32.612	33.582	33.208	32.707	3.92%	1.61%	0.02%
Central & South America	**5.318**	**6.267**	**6.544**	**6.940**	**7.749**	**8.382**	**8.843**	**9.300**	**2.10%**	**1.70%**	**1.22%**
Argentina	1.753	1.585	1.386	2.483	3.114	3.559	3.856	4.106	-2.32%	8.43%	1.86%
Brazil	0.432	0.570	0.762	0.338	0.158	0.095	0.048	0.023	5.84%	-14.55%	-11.97%
Chile	0.068	0.065	0.025	0.011	0.005	0.002	0.051	0.076	-9.34%	-15.00%	19.85%
Colombia	0.253	0.454	0.502	0.427	0.315	0.223	0.203	0.315	7.08%	-4.55%	0.00%
Peru	0.073	0.291	0.440	0.455	0.486	0.546	0.575	0.594	19.62%	0.98%	1.35%
Trinidad and Tobago	1.094	1.512	1.480	1.470	1.571	1.570	1.588	1.557	3.07%	0.60%	-0.06%
Venezuela	1.172	1.201	1.253	1.223	1.548	1.808	1.896	1.859	0.66%	2.14%	1.23%
Other Central & South America	0.472	0.589	0.695	0.532	0.551	0.578	0.626	0.770	3.94%	-2.29%	2.26%
Europe	**11.723**	**11.155**	**9.767**	**10.024**	**10.050**	**9.165**	**8.366**	**7.399**	**-1.81%**	**0.29%**	**-2.02%**
Austria	0.061	0.064	0.041	0.032	0.030	0.017	0.011	0.007	-3.82%	-3.29%	-9.40%
Belgium	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	---	---	---
France	0.063	0.048	0.013	0.006	0.012	0.018	0.012	0.031	-14.43%	-0.79%	6.38%
Germany	0.689	0.526	0.330	0.182	0.229	0.427	0.585	0.448	-7.10%	-3.56%	4.56%
Italy	0.426	0.297	0.239	0.160	0.246	0.226	0.146	0.123	-5.63%	0.31%	-4.52%
Netherlands	2.773	3.131	3.129	2.913	2.378	1.566	0.911	0.554	1.21%	-2.71%	-9.25%
Norway	3.196	3.849	3.742	4.182	4.423	4.268	3.965	3.786	1.59%	1.68%	-1.03%
Poland	0.214	0.215	0.183	0.149	0.090	0.051	0.071	0.118	-1.55%	-6.89%	1.83%
Portugal	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	---	---	---
Romania	0.413	0.374	0.362	0.475	0.452	0.361	0.363	0.293	-1.32%	2.26%	-2.86%
Spain	0.006	0.002	0.001	0.001	0.008	0.012	0.040	0.176	-13.55%	19.45%	22.77%
Turkey	0.032	0.024	0.048	0.047	0.029	0.018	0.011	0.007	4.19%	-4.80%	-9.02%
United Kingdom	3.275	2.124	1.306	1.472	1.752	1.801	1.902	1.599	-8.78%	2.98%	-0.61%
Other Europe	0.574	0.502	0.373	0.406	0.401	0.402	0.348	0.258	-4.24%	0.74%	-2.90%
Eurasia	**27.386**	**27.903**	**28.486**	**29.334**	**31.995**	**33.543**	**34.616**	**35.451**	**0.39%**	**1.17%**	**0.69%**
Kazakhstan	0.428	0.441	0.632	1.007	1.348	1.470	1.547	1.635	3.98%	7.87%	1.29%
Russia	21.698	22.372	21.659	21.322	22.713	23.722	24.451	24.843	-0.02%	0.48%	0.60%
Turkmenistan	2.225	1.600	2.572	3.162	3.790	4.351	5.264	6.146	1.46%	3.95%	3.28%
Ukraine	0.685	0.684	0.604	0.301	0.439	0.761	0.945	0.978	-1.25%	-3.14%	5.49%
Uzbekistan	2.119	2.130	2.461	3.130	3.130	2.510	1.656	1.080	1.51%	2.43%	-6.85%
Other Eurasia	0.232	0.677	0.558	0.412	0.575	0.731	0.754	0.769	9.16%	0.30%	1.96%
Middle East	**12.334**	**18.699**	**21.346**	**22.521**	**24.345**	**25.793**	**27.399**	**28.716**	**5.64%**	**1.32%**	**1.11%**
Iran	3.818	6.031	6.405	6.727	7.114	7.473	7.756	8.036	5.31%	1.06%	0.82%
Qatar	1.826	4.359	5.704	5.934	6.469	6.719	6.758	6.779	12.07%	1.27%	0.31%
Oman	0.748	1.035	1.133	1.227	1.331	1.384	1.423	1.454	4.23%	1.62%	0.59%
Saudi Arabia	2.860	3.424	3.916	4.303	4.846	5.325	5.762	6.230	3.19%	2.15%	1.69%
United Arab Emirates	1.828	1.992	2.008	1.891	1.880	1.929	2.081	2.240	0.94%	-0.65%	1.17%
Other Middle East	1.255	1.858	2.181	2.439	2.705	2.963	3.620	3.977	5.68%	2.18%	2.60%
Africa	**6.877**	**8.553**	**7.425**	**8.504**	**10.019**	**11.440**	**13.234**	**14.404**	**0.77%**	**3.04%**	**2.45%**
Algeria	3.613	3.465	3.429	3.545	3.832	4.193	4.384	3.924	-0.52%	1.12%	0.16%
Egypt	1.610	2.284	1.748	1.941	2.128	2.071	2.436	2.972	0.83%	1.99%	2.25%
Nigeria	0.862	1.317	1.214	1.292	1.757	2.045	2.747	3.636	3.49%	3.76%	4.97%
Other Africa	0.792	1.486	1.034	1.726	2.302	3.132	3.667	3.871	2.70%	8.34%	3.53%
Asia & Oceania	**12.907**	**17.527**	**19.398**	**24.714**	**28.180**	**30.908**	**33.413**	**32.441**	**4.16%**	**3.80%**	**0.94%**
Australia	1.266	1.708	3.527	6.005	6.167	6.282	6.603	6.603	10.79%	5.75%	0.46%
China	1.763	3.334	3.748	3.320	4.536	5.404	6.748	6.725	7.83%	1.93%	2.66%
India	1.153	1.848	1.186	1.476	1.765	1.870	1.737	1.350	0.28%	4.06%	-1.77%
Indonesia	2.406	3.047	2.553	3.249	3.889	5.114	7.149	8.433	0.59%	4.30%	5.30%
Japan	0.191	0.171	0.076	0.029	0.032	0.015	0.009	0.006	-8.84%	-8.31%	-10.77%
Malaysia	2.147	2.347	2.644	3.592	4.077	4.360	3.977	3.316	2.10%	4.43%	-1.37%
Myanmar	0.479	0.437	0.413	0.541	0.664	1.119	1.559	1.348	-1.46%	4.87%	4.83%
Pakistan	1.194	1.484	1.430	1.773	2.109	2.312	2.022	1.412	1.82%	3.96%	-2.64%
Singapore	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	---	---	---
South Korea	0.017	0.033	0.014	0.007	0.005	0.002	0.001	0.000	-1.86%	-9.89%	-15.00%
Thailand	0.925	1.378	1.519	1.403	1.234	0.810	0.578	0.481	5.08%	-2.06%	-6.09%
Other Asia & Oceania	1.366	1.739	2.289	3.320	3.702	3.620	3.031	2.767	5.30%	4.93%	-1.92%
World	**104.006**	**120.194**	**127.893**	**141.845**	**154.503**	**163.840**	**171.403**	**174.208**	**2.09%**	**1.91%**	**0.80%**

LNG20_HRR12 Case (Supply)(tcf)

	2005	2010	2015	2020	2025	2030	2035	2040	cagr 2005-15	cagr 2015-25	cagr 2025-40
North America	**27.461**	**30.089**	**35.098**	**40.270**	**42.813**	**45.448**	**46.475**	**47.460**	**2.48%**	**2.01%**	**0.69%**
Canada	7.185	5.909	5.694	6.644	7.966	8.556	8.820	8.892	-2.30%	3.41%	0.74%
Mexico	1.349	1.799	1.251	0.661	0.873	1.283	2.426	3.213	-0.75%	-3.53%	9.07%
United States	18.927	22.382	28.152	32.965	33.974	35.609	35.229	35.355	4.05%	1.90%	0.27%
Central & South America	**5.318**	**6.267**	**6.545**	**6.934**	**7.742**	**8.384**	**8.844**	**9.295**	**2.10%**	**1.69%**	**1.23%**
Argentina	1.753	1.585	1.386	2.483	3.117	3.560	3.853	4.101	-2.32%	8.44%	1.84%
Brazil	0.432	0.570	0.762	0.338	0.156	0.094	0.048	0.023	5.84%	-14.68%	-11.89%
Chile	0.068	0.065	0.025	0.011	0.005	0.002	0.050	0.075	-9.34%	-15.00%	19.80%
Colombia	0.253	0.454	0.502	0.427	0.315	0.223	0.205	0.318	7.08%	-4.55%	0.05%
Peru	0.073	0.291	0.442	0.454	0.486	0.545	0.572	0.596	19.66%	0.96%	1.36%
Trinidad and Tobago	1.094	1.512	1.476	1.470	1.567	1.572	1.588	1.561	3.04%	0.59%	-0.02%
Venezuela	1.172	1.201	1.253	1.224	1.548	1.805	1.894	1.861	0.66%	2.14%	1.24%
Other Central & South America	0.472	0.589	0.698	0.526	0.549	0.583	0.635	0.760	3.99%	-2.38%	2.20%
Europe	**11.723**	**11.155**	**9.771**	**10.021**	**10.027**	**9.144**	**8.363**	**7.376**	**-1.81%**	**0.26%**	**-2.03%**
Austria	0.061	0.064	0.041	0.032	0.029	0.017	0.011	0.007	-3.80%	-3.39%	-9.30%
Belgium	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	---	---	---
France	0.063	0.048	0.013	0.006	0.011	0.018	0.012	0.025	-14.43%	-2.05%	5.88%
Germany	0.689	0.526	0.329	0.181	0.230	0.423	0.588	0.445	-7.12%	-3.54%	4.52%
Italy	0.426	0.297	0.239	0.160	0.245	0.226	0.147	0.121	-5.63%	0.26%	-4.58%
Netherlands	2.773	3.131	3.129	2.917	2.378	1.563	0.915	0.539	1.21%	-2.71%	-9.42%
Norway	3.196	3.849	3.740	4.174	4.425	4.267	3.957	3.792	1.58%	1.70%	-1.02%
Poland	0.214	0.215	0.184	0.150	0.089	0.050	0.072	0.112	-1.51%	-6.95%	1.49%
Portugal	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	---	---	---
Romania	0.413	0.374	0.360	0.470	0.455	0.366	0.367	0.288	-1.38%	2.37%	-2.99%
Spain	0.006	0.002	0.001	0.001	0.009	0.012	0.046	0.192	-13.56%	20.25%	22.93%
Turkey	0.032	0.024	0.049	0.047	0.029	0.018	0.011	0.007	4.56%	-5.22%	-9.10%
United Kingdom	3.275	2.124	1.310	1.479	1.731	1.787	1.891	1.589	-8.76%	2.83%	-0.57%
Other Europe	0.574	0.502	0.376	0.405	0.398	0.398	0.345	0.258	-4.16%	0.57%	-2.83%
Eurasia	**27.386**	**27.903**	**28.478**	**29.343**	**32.002**	**33.585**	**34.591**	**35.508**	**0.39%**	**1.17%**	**0.70%**
Kazakhstan	0.428	0.441	0.630	1.012	1.356	1.477	1.523	1.596	3.95%	7.96%	1.09%
Russia	21.698	22.372	21.662	21.327	22.718	23.696	24.447	25.030	-0.02%	0.48%	0.65%
Turkmenistan	2.225	1.600	2.569	3.158	3.790	4.406	5.282	6.096	1.45%	3.97%	3.22%
Ukraine	0.685	0.684	0.604	0.310	0.439	0.764	0.922	0.955	-1.25%	-3.14%	5.32%
Uzbekistan	2.119	2.130	2.455	3.119	3.122	2.517	1.666	1.075	1.49%	2.43%	-6.86%
Other Eurasia	0.232	0.677	0.558	0.417	0.578	0.725	0.752	0.755	9.16%	0.35%	1.80%
Middle East	**12.334**	**18.699**	**21.351**	**22.506**	**24.330**	**25.805**	**27.330**	**28.810**	**5.64%**	**1.31%**	**1.13%**
Iran	3.818	6.031	6.406	6.720	7.108	7.467	7.718	8.083	5.31%	1.04%	0.86%
Qatar	1.826	4.359	5.705	5.932	6.456	6.720	6.753	6.786	12.07%	1.24%	0.33%
Oman	0.748	1.035	1.133	1.227	1.333	1.383	1.420	1.454	4.24%	1.64%	0.58%
Saudi Arabia	2.860	3.424	3.916	4.303	4.854	5.330	5.743	6.201	3.19%	2.17%	1.65%
United Arab Emirates	1.828	1.992	2.007	1.893	1.880	1.928	2.090	2.213	0.94%	-0.65%	1.09%
Other Middle East	1.255	1.858	2.183	2.431	2.699	2.976	3.605	4.073	5.70%	2.14%	2.78%
Africa	**6.877**	**8.553**	**7.429**	**8.510**	**10.022**	**11.426**	**13.348**	**14.538**	**0.78%**	**3.04%**	**2.51%**
Algeria	3.613	3.465	3.429	3.537	3.833	4.179	4.398	3.937	-0.52%	1.12%	0.18%
Egypt	1.610	2.284	1.749	1.943	2.137	2.062	2.420	2.952	0.83%	2.03%	2.18%
Nigeria	0.862	1.317	1.218	1.306	1.756	2.035	2.749	3.630	3.52%	3.73%	4.96%
Other Africa	0.792	1.486	1.034	1.725	2.296	3.150	3.782	4.019	2.70%	8.30%	3.80%
Asia & Oceania	**12.907**	**17.527**	**19.390**	**24.704**	**28.041**	**30.848**	**33.412**	**32.438**	**4.15%**	**3.76%**	**0.98%**
Australia	1.266	1.708	3.519	6.002	6.162	6.303	6.601	6.579	10.77%	5.76%	0.44%
China	1.763	3.334	3.746	3.314	4.445	5.336	6.704	6.724	7.83%	1.73%	2.80%
India	1.153	1.848	1.188	1.479	1.765	1.867	1.743	1.349	0.30%	4.04%	-1.78%
Indonesia	2.406	3.047	2.552	3.249	3.886	5.115	7.169	8.427	0.59%	4.29%	5.30%
Japan	0.191	0.171	0.076	0.029	0.031	0.015	0.009	0.006	-8.76%	-8.53%	-10.81%
Malaysia	2.147	2.347	2.643	3.591	4.064	4.358	3.982	3.323	2.10%	4.40%	-1.33%
Myanmar	0.479	0.437	0.414	0.541	0.659	1.115	1.558	1.349	-1.45%	4.76%	4.90%
Pakistan	1.194	1.484	1.430	1.772	2.107	2.307	2.030	1.416	1.82%	3.95%	-2.62%
Singapore	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	---	---	---
South Korea	0.017	0.033	0.014	0.007	0.005	0.002	0.001	0.000	-1.79%	-9.96%	-15.00%
Thailand	0.925	1.378	1.519	1.404	1.232	0.807	0.581	0.483	5.08%	-2.08%	-6.04%
Other Asia & Oceania	1.366	1.739	2.290	3.316	3.685	3.624	3.036	2.782	5.30%	4.87%	-1.86%
World	**104.006**	**120.194**	**128.062**	**142.289**	**154.977**	**164.640**	**172.364**	**175.426**	**2.10%**	**1.93%**	**0.83%**

LNG20_LRR12 Case (Supply)(tcf)

	2005	2010	2015	2020	2025	2030	2035	2040	cagr 2005-15	cagr 2015-25	cagr 2025-40
North America	**27.461**	**30.089**	**34.714**	**39.293**	**41.498**	**43.416**	**44.862**	**45.568**	**2.37%**	**1.80%**	**0.63%**
Canada	7.185	5.909	6.097	8.098	8.740	8.807	8.882	8.933	-1.63%	3.67%	0.15%
Mexico	1.349	1.799	1.251	0.823	1.586	3.068	4.765	5.062	-0.74%	2.40%	8.04%
United States	18.927	22.382	27.365	30.371	31.172	31.541	31.215	31.574	3.76%	1.31%	0.09%
Central & South America	**5.318**	**6.267**	**6.546**	**6.945**	**7.743**	**8.394**	**8.835**	**9.282**	**2.10%**	**1.69%**	**1.22%**
Argentina	1.753	1.585	1.386	2.483	3.116	3.559	3.856	4.107	-2.32%	8.44%	1.86%
Brazil	0.432	0.570	0.762	0.338	0.158	0.097	0.048	0.023	5.84%	-14.58%	-11.98%
Chile	0.068	0.065	0.025	0.011	0.005	0.002	0.050	0.075	-9.34%	-15.00%	19.78%
Colombia	0.253	0.454	0.502	0.427	0.315	0.223	0.201	0.284	7.08%	-4.56%	-0.67%
Peru	0.073	0.291	0.442	0.452	0.488	0.550	0.568	0.596	19.67%	0.99%	1.33%
Trinidad and Tobago	1.094	1.512	1.480	1.482	1.567	1.583	1.587	1.558	3.07%	0.57%	-0.04%
Venezuela	1.172	1.201	1.253	1.225	1.546	1.791	1.895	1.892	0.66%	2.13%	1.36%
Other Central & South America	0.472	0.589	0.695	0.527	0.549	0.589	0.630	0.746	3.95%	-2.34%	2.07%
Europe	**11.723**	**11.155**	**9.766**	**10.044**	**10.034**	**9.125**	**8.396**	**7.349**	**-1.81%**	**0.27%**	**-2.05%**
Austria	0.061	0.064	0.041	0.032	0.030	0.017	0.011	0.007	-3.86%	-3.10%	-9.54%
Belgium	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	---	---	---
France	0.063	0.048	0.013	0.006	0.013	0.017	0.011	0.029	-14.44%	0.01%	5.23%
Germany	0.689	0.526	0.329	0.179	0.232	0.436	0.579	0.444	-7.12%	-3.42%	4.42%
Italy	0.426	0.297	0.239	0.163	0.245	0.226	0.145	0.127	-5.63%	0.27%	-4.27%
Netherlands	2.773	3.131	3.133	2.934	2.376	1.547	0.901	0.560	1.23%	-2.73%	-9.18%
Norway	3.196	3.849	3.734	4.163	4.419	4.236	4.018	3.758	1.57%	1.70%	-1.07%
Poland	0.214	0.215	0.183	0.150	0.090	0.050	0.059	0.108	-1.56%	-6.81%	1.19%
Portugal	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	---	---	---
Romania	0.413	0.374	0.361	0.474	0.454	0.364	0.362	0.292	-1.34%	2.32%	-2.91%
Spain	0.006	0.002	0.001	0.001	0.008	0.012	0.043	0.191	-13.56%	18.89%	23.81%
Turkey	0.032	0.024	0.047	0.048	0.029	0.018	0.011	0.007	4.12%	-4.72%	-8.85%
United Kingdom	3.275	2.124	1.310	1.487	1.736	1.804	1.909	1.565	-8.75%	2.86%	-0.69%
Other Europe	0.574	0.502	0.374	0.408	0.401	0.397	0.346	0.260	-4.20%	0.69%	-2.84%
Eurasia	**27.386**	**27.903**	**28.488**	**29.355**	**31.986**	**33.590**	**34.534**	**35.416**	**0.40%**	**1.16%**	**0.68%**
Kazakhstan	0.428	0.441	0.632	1.014	1.355	1.473	1.529	1.640	3.98%	7.93%	1.28%
Russia	21.698	22.372	21.653	21.329	22.670	23.748	24.423	24.852	-0.02%	0.46%	0.61%
Turkmenistan	2.225	1.600	2.580	3.172	3.823	4.371	5.225	6.120	1.49%	4.01%	3.19%
Ukraine	0.685	0.684	0.604	0.301	0.433	0.748	0.939	0.962	-1.25%	-3.27%	5.47%
Uzbekistan	2.119	2.130	2.461	3.112	3.112	2.519	1.674	1.084	1.51%	2.37%	-6.79%
Other Eurasia	0.232	0.677	0.558	0.426	0.592	0.731	0.745	0.757	9.15%	0.59%	1.66%
Middle East	**12.334**	**18.699**	**21.349**	**22.515**	**24.354**	**25.826**	**27.423**	**28.838**	**5.64%**	**1.33%**	**1.13%**
Iran	3.818	6.031	6.406	6.726	7.109	7.475	7.719	8.065	5.31%	1.05%	0.84%
Qatar	1.826	4.359	5.703	5.929	6.478	6.722	6.759	6.782	12.06%	1.28%	0.31%
Oman	0.748	1.035	1.134	1.228	1.334	1.384	1.422	1.453	4.24%	1.64%	0.57%
Saudi Arabia	2.860	3.424	3.915	4.304	4.847	5.325	5.764	6.231	3.19%	2.16%	1.69%
United Arab Emirates	1.828	1.992	2.008	1.897	1.878	1.926	2.087	2.228	0.94%	-0.66%	1.14%
Other Middle East	1.255	1.858	2.183	2.432	2.708	2.994	3.672	4.080	5.69%	2.18%	2.77%
Africa	**6.877**	**8.553**	**7.441**	**8.586**	**10.015**	**11.534**	**13.250**	**14.381**	**0.79%**	**3.02%**	**2.44%**
Algeria	3.613	3.465	3.429	3.577	3.839	4.251	4.396	3.921	-0.52%	1.14%	0.14%
Egypt	1.610	2.284	1.749	1.938	2.107	2.058	2.443	2.958	0.83%	1.88%	2.29%
Nigeria	0.862	1.317	1.229	1.338	1.757	2.027	2.747	3.645	3.61%	3.64%	4.98%
Other Africa	0.792	1.486	1.034	1.734	2.311	3.198	3.665	3.858	2.70%	8.38%	3.47%
Asia & Oceania	**12.907**	**17.527**	**19.383**	**24.753**	**28.276**	**31.061**	**33.312**	**32.447**	**4.15%**	**3.85%**	**0.92%**
Australia	1.266	1.708	3.520	6.028	6.155	6.282	6.631	6.712	10.77%	5.75%	0.58%
China	1.763	3.334	3.741	3.332	4.589	5.493	6.628	6.636	7.82%	2.06%	2.49%
India	1.153	1.848	1.184	1.475	1.761	1.888	1.733	1.350	0.27%	4.05%	-1.76%
Indonesia	2.406	3.047	2.554	3.249	3.895	5.152	7.128	8.401	0.60%	4.31%	5.26%
Japan	0.191	0.171	0.075	0.030	0.032	0.016	0.009	0.006	-8.94%	-8.07%	-10.95%
Malaysia	2.147	2.347	2.643	3.592	4.094	4.353	3.977	3.330	2.10%	4.47%	-1.37%
Myanmar	0.479	0.437	0.413	0.541	0.663	1.126	1.559	1.336	-1.46%	4.84%	4.79%
Pakistan	1.194	1.484	1.430	1.773	2.108	2.310	2.026	1.419	1.82%	3.96%	-2.60%
Singapore	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	---	---	---
South Korea	0.017	0.033	0.014	0.007	0.005	0.002	0.001	0.000	-1.90%	-9.86%	-15.00%
Thailand	0.925	1.378	1.519	1.404	1.231	0.810	0.578	0.481	5.08%	-2.08%	-6.07%
Other Asia & Oceania	1.366	1.739	2.290	3.322	3.744	3.629	3.043	2.776	5.30%	5.04%	-1.97%
World	**104.006**	**120.194**	**127.688**	**141.491**	**153.907**	**162.946**	**170.611**	**173.282**	**2.07%**	**1.89%**	**0.79%**

LNG20_Hi-D12 Case (Supply)(tcf)

	2005	2010	2015	2020	2025	2030	2035	2040	cagr 2005-15	cagr 2015-25	cagr 2025-40
North America	**27.461**	**30.089**	**35.077**	**40.793**	**43.757**	**46.889**	**48.100**	**49.000**	**2.48%**	**2.24%**	**0.76%**
Canada	7.185	5.909	5.959	7.794	8.705	8.792	8.858	8.923	-1.85%	3.86%	0.16%
Mexico	1.349	1.799	1.251	0.733	1.100	2.573	3.996	5.090	-0.74%	-1.28%	10.75%
United States	18.927	22.382	27.867	32.266	33.951	35.525	35.246	34.988	3.94%	1.99%	0.20%
Central & South America	**5.318**	**6.267**	**6.540**	**6.923**	**7.748**	**8.392**	**8.824**	**9.327**	**2.09%**	**1.71%**	**1.24%**
Argentina	1.753	1.585	1.386	2.484	3.117	3.559	3.847	4.086	-2.32%	8.44%	1.82%
Brazil	0.432	0.570	0.762	0.338	0.156	0.097	0.048	0.023	5.84%	-14.67%	-11.93%
Chile	0.068	0.065	0.025	0.011	0.005	0.002	0.050	0.075	-9.34%	-15.00%	19.79%
Colombia	0.253	0.454	0.502	0.427	0.315	0.223	0.203	0.280	7.08%	-4.54%	-0.79%
Peru	0.073	0.291	0.442	0.455	0.486	0.548	0.573	0.590	19.65%	0.97%	1.29%
Trinidad and Tobago	1.094	1.512	1.475	1.466	1.567	1.574	1.586	1.565	3.03%	0.61%	-0.01%
Venezuela	1.172	1.201	1.253	1.222	1.549	1.804	1.881	1.916	0.66%	2.14%	1.43%
Other Central & South America	0.472	0.589	0.695	0.519	0.552	0.585	0.637	0.792	3.94%	-2.28%	2.43%
Europe	**11.723**	**11.155**	**9.768**	**10.039**	**10.021**	**9.120**	**8.354**	**7.386**	**-1.81%**	**0.26%**	**-2.01%**
Austria	0.061	0.064	0.041	0.032	0.029	0.017	0.011	0.007	-3.82%	-3.37%	-9.23%
Belgium	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	---	---	---
France	0.063	0.048	0.013	0.006	0.013	0.017	0.011	0.023	-14.44%	-0.49%	4.16%
Germany	0.689	0.526	0.329	0.177	0.231	0.416	0.585	0.452	-7.13%	-3.48%	4.58%
Italy	0.426	0.297	0.239	0.164	0.246	0.222	0.144	0.124	-5.63%	0.31%	-4.45%
Netherlands	2.773	3.131	3.135	2.937	2.373	1.543	0.899	0.560	1.23%	-2.75%	-9.17%
Norway	3.196	3.849	3.740	4.172	4.429	4.272	3.963	3.769	1.58%	1.71%	-1.07%
Poland	0.214	0.215	0.182	0.149	0.090	0.050	0.061	0.110	-1.59%	-6.77%	1.33%
Portugal	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	---	---	---
Romania	0.413	0.374	0.361	0.474	0.453	0.362	0.364	0.295	-1.34%	2.29%	-2.80%
Spain	0.006	0.002	0.001	0.001	0.007	0.012	0.044	0.182	-13.56%	17.08%	24.71%
Turkey	0.032	0.024	0.048	0.048	0.029	0.018	0.011	0.007	4.18%	-4.84%	-8.88%
United Kingdom	3.275	2.124	1.305	1.473	1.724	1.793	1.914	1.593	-8.79%	2.83%	-0.53%
Other Europe	0.574	0.502	0.374	0.405	0.397	0.397	0.346	0.262	-4.20%	0.60%	-2.73%
Eurasia	**27.386**	**27.903**	**28.476**	**29.330**	**31.974**	**33.578**	**34.583**	**35.467**	**0.39%**	**1.17%**	**0.69%**
Kazakhstan	0.428	0.441	0.632	1.019	1.363	1.478	1.527	1.624	3.98%	7.99%	1.17%
Russia	21.698	22.372	21.659	21.312	22.683	23.693	24.430	24.870	-0.02%	0.46%	0.62%
Turkmenistan	2.225	1.600	2.568	3.149	3.786	4.394	5.288	6.149	1.44%	3.96%	3.29%
Ukraine	0.685	0.684	0.604	0.302	0.432	0.768	0.922	0.979	-1.25%	-3.29%	5.60%
Uzbekistan	2.119	2.130	2.455	3.123	3.122	2.519	1.670	1.083	1.48%	2.43%	-6.81%
Other Eurasia	0.232	0.677	0.558	0.426	0.587	0.726	0.746	0.762	9.16%	0.51%	1.75%
Middle East	**12.334**	**18.699**	**21.350**	**22.515**	**24.363**	**25.821**	**27.413**	**28.748**	**5.64%**	**1.33%**	**1.11%**
Iran	3.818	6.031	6.406	6.726	7.114	7.470	7.738	8.054	5.31%	1.05%	0.83%
Qatar	1.826	4.359	5.703	5.926	6.477	6.721	6.759	6.783	12.06%	1.28%	0.31%
Oman	0.748	1.035	1.134	1.228	1.331	1.386	1.424	1.451	4.24%	1.62%	0.58%
Saudi Arabia	2.860	3.424	3.917	4.303	4.852	5.333	5.759	6.208	3.19%	2.16%	1.66%
United Arab Emirates	1.828	1.992	2.009	1.899	1.877	1.927	2.085	2.222	0.95%	-0.68%	1.13%
Other Middle East	1.255	1.858	2.182	2.433	2.712	2.985	3.649	4.029	5.69%	2.20%	2.68%
Africa	**6.877**	**8.553**	**7.439**	**8.535**	**10.013**	**11.477**	**13.256**	**14.395**	**0.79%**	**3.02%**	**2.45%**
Algeria	3.613	3.465	3.429	3.540	3.838	4.205	4.381	3.917	-0.52%	1.13%	0.14%
Egypt	1.610	2.284	1.748	1.936	2.104	2.071	2.441	2.952	0.83%	1.87%	2.28%
Nigeria	0.862	1.317	1.229	1.331	1.761	2.040	2.756	3.657	3.61%	3.66%	4.99%
Other Africa	0.792	1.486	1.034	1.729	2.312	3.162	3.678	3.870	2.70%	8.38%	3.50%
Asia & Oceania	**12.907**	**17.527**	**19.392**	**24.711**	**28.208**	**30.910**	**33.315**	**32.493**	**4.16%**	**3.82%**	**0.95%**
Australia	1.266	1.708	3.525	5.998	6.151	6.282	6.614	6.709	10.79%	5.73%	0.58%
China	1.763	3.334	3.747	3.320	4.539	5.388	6.645	6.687	7.83%	1.94%	2.62%
India	1.153	1.848	1.187	1.475	1.762	1.875	1.733	1.346	0.29%	4.03%	-1.78%
Indonesia	2.406	3.047	2.546	3.246	3.888	5.126	7.136	8.419	0.57%	4.32%	5.29%
Japan	0.191	0.171	0.076	0.029	0.032	0.015	0.009	0.006	-8.84%	-8.27%	-10.86%
Malaysia	2.147	2.347	2.644	3.598	4.098	4.361	3.977	3.306	2.10%	4.48%	-1.42%
Myanmar	0.479	0.437	0.413	0.541	0.661	1.120	1.555	1.347	-1.45%	4.81%	4.85%
Pakistan	1.194	1.484	1.430	1.773	2.109	2.313	2.017	1.413	1.82%	3.96%	-2.63%
Singapore	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	---	---	---
South Korea	0.017	0.033	0.014	0.006	0.005	0.002	0.001	0.000	-1.87%	-9.89%	-15.00%
Thailand	0.925	1.378	1.520	1.403	1.229	0.810	0.579	0.480	5.09%	-2.10%	-6.08%
Other Asia & Oceania	1.366	1.739	2.290	3.321	3.731	3.617	3.049	2.780	5.30%	5.00%	-1.94%
World	**104.006**	**120.194**	**128.042**	**142.845**	**156.082**	**166.188**	**173.846**	**176.816**	**2.10%**	**2.00%**	**0.83%**

LNG20_Ref20 Case (Supply)(tcf)

	2005	2010	2015	2020	2025	2030	2035	2040	cagr 2005-15	cagr 2015-25	cagr 2025-40
North America	**27.461**	**30.089**	**34.915**	**39.790**	**42.144**	**45.257**	**48.256**	**49.364**	**2.43%**	**1.90%**	**1.06%**
Canada	7.185	5.909	5.904	7.628	8.640	8.774	8.849	8.938	-1.94%	3.88%	0.23%
Mexico	1.349	1.799	1.251	0.716	1.015	2.464	4.027	5.045	-0.74%	-2.07%	11.28%
United States	18.927	22.382	27.759	31.446	32.489	34.019	35.381	35.381	3.90%	1.59%	0.57%
Central & South America	**5.318**	**6.267**	**6.547**	**6.925**	**7.745**	**8.335**	**8.775**	**9.250**	**2.10%**	**1.69%**	**1.19%**
Argentina	1.753	1.585	1.386	2.485	3.114	3.556	3.849	4.109	-2.32%	8.43%	1.87%
Brazil	0.432	0.570	0.762	0.338	0.157	0.095	0.048	0.023	5.84%	-14.60%	-12.00%
Chile	0.068	0.065	0.025	0.011	0.005	0.002	0.051	0.075	-9.34%	-15.00%	19.78%
Colombia	0.253	0.454	0.502	0.427	0.315	0.224	0.204	0.311	7.08%	-4.55%	-0.08%
Peru	0.073	0.291	0.441	0.455	0.486	0.537	0.576	0.587	19.64%	0.97%	1.27%
Trinidad and Tobago	1.094	1.512	1.481	1.470	1.572	1.559	1.587	1.560	3.07%	0.60%	-0.05%
Venezuela	1.172	1.201	1.253	1.223	1.547	1.800	1.896	1.878	0.66%	2.13%	1.30%
Other Central & South America	0.472	0.589	0.696	0.516	0.548	0.561	0.565	0.706	3.96%	-2.36%	1.70%
Europe	**11.723**	**11.155**	**9.770**	**10.031**	**10.032**	**9.142**	**8.351**	**7.399**	**-1.81%**	**0.26%**	**-2.01%**
Austria	0.061	0.064	0.041	0.031	0.030	0.018	0.011	0.007	-3.83%	-3.31%	-9.16%
Belgium	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	---	---	---
France	0.063	0.048	0.013	0.006	0.012	0.018	0.012	0.029	-14.44%	-1.37%	6.32%
Germany	0.689	0.526	0.329	0.179	0.230	0.424	0.586	0.452	-7.12%	-3.51%	4.60%
Italy	0.426	0.297	0.239	0.157	0.245	0.228	0.146	0.128	-5.63%	0.27%	-4.25%
Netherlands	2.773	3.131	3.133	2.930	2.375	1.556	0.902	0.566	1.23%	-2.73%	-9.12%
Norway	3.196	3.849	3.734	4.169	4.423	4.264	3.964	3.726	1.57%	1.71%	-1.14%
Poland	0.214	0.215	0.184	0.150	0.089	0.050	0.069	0.116	-1.47%	-7.03%	1.76%
Portugal	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	---	---	---
Romania	0.413	0.374	0.360	0.470	0.454	0.366	0.364	0.293	-1.38%	2.37%	-2.88%
Spain	0.006	0.002	0.001	0.001	0.007	0.012	0.045	0.186	-13.56%	17.47%	24.61%
Turkey	0.032	0.024	0.049	0.048	0.029	0.018	0.011	0.007	4.49%	-5.14%	-8.83%
United Kingdom	3.275	2.124	1.310	1.480	1.739	1.791	1.900	1.626	-8.75%	2.87%	-0.45%
Other Europe	0.574	0.502	0.375	0.410	0.400	0.398	0.343	0.263	-4.16%	0.62%	-2.75%
Eurasia	**27.386**	**27.903**	**28.491**	**29.334**	**31.967**	**33.552**	**34.537**	**35.399**	**0.40%**	**1.16%**	**0.68%**
Kazakhstan	0.428	0.441	0.632	1.012	1.347	1.474	1.530	1.638	3.98%	7.86%	1.32%
Russia	21.698	22.372	21.653	21.324	22.693	23.715	24.402	24.833	-0.02%	0.47%	0.60%
Turkmenistan	2.225	1.600	2.581	3.178	3.816	4.369	5.199	6.091	1.50%	3.98%	3.17%
Ukraine	0.685	0.684	0.604	0.302	0.432	0.747	0.954	0.989	-1.25%	-3.30%	5.68%
Uzbekistan	2.119	2.130	2.464	3.106	3.111	2.517	1.673	1.086	1.52%	2.36%	-6.78%
Other Eurasia	0.232	0.677	0.558	0.411	0.569	0.731	0.779	0.762	9.15%	0.20%	1.97%
Middle East	**12.334**	**18.699**	**21.347**	**22.511**	**24.333**	**25.806**	**27.257**	**28.824**	**5.64%**	**1.32%**	**1.14%**
Iran	3.818	6.031	6.405	6.723	7.106	7.468	7.729	8.069	5.31%	1.04%	0.85%
Qatar	1.826	4.359	5.707	5.940	6.459	6.720	6.752	6.779	12.07%	1.25%	0.32%
Oman	0.748	1.035	1.133	1.227	1.333	1.383	1.417	1.467	4.24%	1.64%	0.64%
Saudi Arabia	2.860	3.424	3.916	4.304	4.847	5.323	5.738	6.188	3.19%	2.16%	1.64%
United Arab Emirates	1.828	1.992	2.005	1.884	1.886	1.923	2.075	2.239	0.93%	-0.61%	1.15%
Other Middle East	1.255	1.858	2.181	2.433	2.701	2.989	3.546	4.082	5.68%	2.16%	2.79%
Africa	**6.877**	**8.553**	**7.426**	**8.491**	**10.023**	**11.339**	**13.097**	**14.393**	**0.77%**	**3.04%**	**2.44%**
Algeria	3.613	3.465	3.428	3.530	3.832	4.153	4.349	3.930	-0.52%	1.12%	0.17%
Egypt	1.610	2.284	1.749	1.945	2.138	2.073	2.435	2.955	0.83%	2.03%	2.18%
Nigeria	0.862	1.317	1.214	1.288	1.765	1.999	2.664	3.620	3.49%	3.81%	4.91%
Other Africa	0.792	1.486	1.035	1.728	2.287	3.114	3.650	3.887	2.71%	8.26%	3.60%
Asia & Oceania	**12.907**	**17.527**	**19.399**	**24.761**	**28.223**	**30.472**	**31.902**	**31.739**	**4.16%**	**3.82%**	**0.79%**
Australia	1.266	1.708	3.529	6.004	6.154	6.288	6.617	6.701	10.80%	5.72%	0.57%
China	1.763	3.334	3.747	3.359	4.544	5.041	5.809	6.269	7.83%	1.95%	2.17%
India	1.153	1.848	1.187	1.492	1.824	1.878	1.663	1.305	0.29%	4.39%	-2.21%
Indonesia	2.406	3.047	2.551	3.250	3.886	5.066	6.759	8.218	0.59%	4.30%	5.12%
Japan	0.191	0.171	0.076	0.029	0.032	0.015	0.008	0.005	-8.75%	-8.41%	-11.14%
Malaysia	2.147	2.347	2.643	3.596	4.092	4.369	3.964	3.298	2.10%	4.47%	-1.43%
Myanmar	0.479	0.437	0.413	0.541	0.648	1.064	1.529	1.393	-1.45%	4.59%	5.24%
Pakistan	1.194	1.484	1.430	1.775	2.123	2.307	1.937	1.345	1.82%	4.03%	-3.00%
Singapore	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	---	---	---
South Korea	0.017	0.033	0.014	0.006	0.005	0.002	0.001	0.000	-1.83%	-9.93%	-15.00%
Thailand	0.925	1.378	1.519	1.402	1.227	0.813	0.581	0.479	5.08%	-2.11%	-6.08%
Other Asia & Oceania	1.366	1.739	2.289	3.308	3.687	3.628	3.034	2.724	5.30%	4.89%	-2.00%
World	**104.006**	**120.194**	**127.896**	**141.842**	**154.466**	**163.902**	**172.176**	**176.367**	**2.09%**	**1.91%**	**0.89%**

LNG20_HRR20 Case (Supply)(tcf)

	2005	2010	2015	2020	2025	2030	2035	2040	cagr 2005-15	cagr 2015-25	cagr 2025-40
North America	**27.461**	**30.089**	**35.083**	**40.321**	**42.841**	**46.683**	**49.606**	**50.767**	**2.48%**	**2.02%**	**1.14%**
Canada	7.185	5.909	5.716	6.731	8.051	8.617	8.832	8.921	-2.26%	3.49%	0.69%
Mexico	1.349	1.799	1.251	0.670	0.870	1.506	2.848	3.800	-0.75%	-3.57%	10.33%
United States	18.927	22.382	28.116	32.920	33.920	36.560	37.927	38.047	4.04%	1.89%	0.77%
Central & South America	**5.318**	**6.267**	**6.542**	**6.932**	**7.772**	**8.346**	**8.786**	**9.232**	**2.09%**	**1.74%**	**1.15%**
Argentina	1.753	1.585	1.386	2.484	3.117	3.558	3.854	4.105	-2.32%	8.44%	1.85%
Brazil	0.432	0.570	0.762	0.338	0.156	0.095	0.048	0.023	5.84%	-14.65%	-11.91%
Chile	0.068	0.065	0.025	0.011	0.005	0.002	0.051	0.075	-9.34%	-15.00%	19.74%
Colombia	0.253	0.454	0.502	0.427	0.314	0.223	0.200	0.291	7.08%	-4.57%	-0.51%
Peru	0.073	0.291	0.440	0.454	0.488	0.522	0.577	0.597	19.61%	1.03%	1.35%
Trinidad and Tobago	1.094	1.512	1.479	1.468	1.570	1.559	1.585	1.560	3.06%	0.60%	-0.04%
Venezuela	1.172	1.201	1.253	1.225	1.553	1.804	1.908	1.921	0.66%	2.17%	1.43%
Other Central & South America	0.472	0.589	0.694	0.524	0.569	0.583	0.564	0.661	3.94%	-1.98%	1.01%
Europe	**11.723**	**11.155**	**9.771**	**10.017**	**10.051**	**9.116**	**8.377**	**7.324**	**-1.80%**	**0.28%**	**-2.09%**
Austria	0.061	0.064	0.042	0.033	0.030	0.017	0.011	0.007	-3.75%	-3.36%	-9.43%
Belgium	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	---	---	---
France	0.063	0.048	0.013	0.006	0.013	0.018	0.012	0.024	-14.43%	-0.44%	4.32%
Germany	0.689	0.526	0.329	0.183	0.232	0.427	0.582	0.449	-7.11%	-3.43%	4.49%
Italy	0.426	0.297	0.239	0.158	0.248	0.225	0.146	0.121	-5.63%	0.38%	-4.67%
Netherlands	2.773	3.131	3.131	2.917	2.379	1.559	0.912	0.543	1.22%	-2.71%	-9.38%
Norway	3.196	3.849	3.736	4.160	4.431	4.237	4.007	3.739	1.57%	1.72%	-1.13%
Poland	0.214	0.215	0.184	0.150	0.089	0.050	0.066	0.114	-1.47%	-7.02%	1.65%
Portugal	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	---	---	---
Romania	0.413	0.374	0.361	0.473	0.454	0.361	0.363	0.288	-1.33%	2.30%	-2.98%
Spain	0.006	0.002	0.001	0.001	0.008	0.012	0.038	0.183	-13.56%	19.27%	23.22%
Turkey	0.032	0.024	0.048	0.049	0.029	0.018	0.011	0.007	4.32%	-4.86%	-9.33%
United Kingdom	3.275	2.124	1.310	1.480	1.736	1.792	1.885	1.594	-8.76%	2.85%	-0.57%
Other Europe	0.574	0.502	0.376	0.408	0.403	0.399	0.345	0.256	-4.15%	0.69%	-2.98%
Eurasia	**27.386**	**27.903**	**28.482**	**29.334**	**31.976**	**33.581**	**34.590**	**35.454**	**0.39%**	**1.16%**	**0.69%**
Kazakhstan	0.428	0.441	0.630	1.008	1.355	1.482	1.549	1.656	3.95%	7.95%	1.35%
Russia	21.698	22.372	21.655	21.320	22.720	23.757	24.441	24.863	-0.02%	0.48%	0.60%
Turkmenistan	2.225	1.600	2.575	3.165	3.782	4.334	5.244	6.129	1.47%	3.92%	3.27%
Ukraine	0.685	0.684	0.604	0.298	0.433	0.757	0.913	0.965	-1.25%	-3.29%	5.49%
Uzbekistan	2.119	2.130	2.460	3.113	3.113	2.520	1.676	1.091	1.50%	2.39%	-6.75%
Other Eurasia	0.232	0.677	0.558	0.430	0.574	0.730	0.767	0.751	9.15%	0.28%	1.81%
Middle East	**12.334**	**18.699**	**21.348**	**22.509**	**24.307**	**25.826**	**27.258**	**28.819**	**5.64%**	**1.31%**	**1.14%**
Iran	3.818	6.031	6.405	6.720	7.103	7.477	7.740	8.091	5.31%	1.04%	0.87%
Qatar	1.826	4.359	5.704	5.933	6.455	6.718	6.756	6.774	12.07%	1.24%	0.32%
Oman	0.748	1.035	1.133	1.227	1.332	1.384	1.421	1.457	4.24%	1.63%	0.60%
Saudi Arabia	2.860	3.424	3.916	4.304	4.845	5.320	5.744	6.199	3.19%	2.15%	1.66%
United Arab Emirates	1.828	1.992	2.007	1.892	1.875	1.923	2.088	2.237	0.94%	-0.68%	1.18%
Other Middle East	1.255	1.858	2.182	2.433	2.697	3.003	3.508	4.060	5.69%	2.14%	2.77%
Africa	**6.877**	**8.553**	**7.420**	**8.484**	**10.018**	**11.225**	**13.007**	**14.415**	**0.76%**	**3.05%**	**2.46%**
Algeria	3.613	3.465	3.428	3.539	3.828	4.103	4.302	3.938	-0.52%	1.11%	0.19%
Egypt	1.610	2.284	1.749	1.943	2.131	2.068	2.410	2.939	0.83%	2.00%	2.16%
Nigeria	0.862	1.317	1.209	1.283	1.756	2.000	2.644	3.623	3.44%	3.81%	4.95%
Other Africa	0.792	1.486	1.034	1.720	2.302	3.054	3.651	3.914	2.70%	8.33%	3.60%
Asia & Oceania	**12.907**	**17.527**	**19.413**	**24.786**	**28.060**	**30.061**	**31.571**	**31.483**	**4.17%**	**3.75%**	**0.77%**
Australia	1.266	1.708	3.525	5.998	6.156	6.239	6.551	6.621	10.78%	5.74%	0.49%
China	1.763	3.334	3.764	3.386	4.459	4.801	5.610	6.245	7.88%	1.71%	2.27%
India	1.153	1.848	1.190	1.498	1.831	1.844	1.659	1.306	0.31%	4.40%	-2.23%
Indonesia	2.406	3.047	2.545	3.246	3.880	5.021	6.721	8.112	0.56%	4.31%	5.04%
Japan	0.191	0.171	0.077	0.029	0.031	0.015	0.008	0.005	-8.65%	-8.57%	-11.27%
Malaysia	2.147	2.347	2.645	3.601	4.067	4.353	3.967	3.284	2.11%	4.40%	-1.42%
Myanmar	0.479	0.437	0.414	0.541	0.638	1.054	1.524	1.397	-1.44%	4.43%	5.36%
Pakistan	1.194	1.484	1.430	1.776	2.117	2.301	1.919	1.338	1.83%	4.00%	-3.01%
Singapore	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	---	---	---
South Korea	0.017	0.033	0.015	0.007	0.005	0.002	0.001	0.000	-1.75%	-10.00%	-15.00%
Thailand	0.925	1.378	1.521	1.400	1.231	0.808	0.584	0.471	5.09%	-2.09%	-6.20%
Other Asia & Oceania	1.366	1.739	2.288	3.303	3.644	3.624	3.028	2.703	5.30%	4.76%	-1.97%
World	**104.006**	**120.194**	**128.059**	**142.383**	**155.025**	**164.839**	**173.195**	**177.494**	**2.10%**	**1.93%**	**0.91%**

D4. Net LNG Exports (tcf)[48]

Ref_Ref Case (Net LNG Exports)

	2005	2010	2015	2020	2025	2030	2035	2040
North America	**-0.551**	**-0.637**	**-0.404**	**1.100**	**1.425**	**1.978**	**1.983**	**2.387**
Canada	0.000	-0.072	-0.096	-0.090	-0.089	-0.089	-0.088	0.311
Mexico	0.000	-0.198	-0.253	-0.256	-0.253	-0.253	-0.253	-0.253
United States	-0.551	-0.366	-0.054	1.446	1.766	2.319	2.325	2.329
Central & South America	**0.463**	**0.464**	**0.404**	**0.097**	**0.152**	**0.151**	**0.291**	**0.298**
Argentina	0.000	-0.062	-0.091	-0.092	-0.091	-0.091	-0.091	-0.091
Brazil	0.000	-0.096	-0.113	-0.125	-0.113	-0.113	-0.113	-0.113
Chile	0.000	-0.106	-0.162	-0.202	-0.199	-0.199	-0.199	-0.199
Colombia	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Peru	0.000	0.064	0.183	0.181	0.182	0.182	0.182	0.182
Trinidad and Tobago	0.495	0.719	0.671	0.471	0.538	0.560	0.722	0.730
Venezuela	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other Central & South America	-0.032	-0.055	-0.084	-0.137	-0.164	-0.188	-0.210	-0.211
Europe	**-1.640**	**-2.856**	**-2.170**	**-3.138**	**-3.078**	**-2.827**	**-2.381**	**-2.141**
Austria	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Belgium	-0.103	-0.203	-0.094	-0.096	-0.094	-0.094	-0.094	-0.094
France	-0.442	-0.483	-0.389	-0.498	-0.606	-0.666	-0.541	-0.423
Germany	0.000	0.000	-0.062	-0.063	-0.062	-0.062	-0.062	-0.062
Italy	-0.086	-0.315	-0.126	-0.434	-0.403	-0.403	-0.279	-0.186
Netherlands	0.000	0.000	-0.145	-0.146	-0.144	-0.151	-0.144	-0.144
Norway	0.000	0.166	0.184	0.107	0.181	0.184	0.184	0.185
Poland	0.000	0.000	0.000	-0.148	-0.145	0.000	0.000	0.000
Portugal	-0.054	-0.104	-0.119	-0.120	-0.119	-0.119	-0.119	-0.119
Romania	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Spain	-0.753	-0.955	-0.674	-0.682	-0.673	-0.705	-0.701	-0.673
Turkey	-0.168	-0.275	-0.130	-0.284	-0.279	-0.158	-0.015	-0.015
United Kingdom	-0.018	-0.647	-0.431	-0.436	-0.430	-0.441	-0.430	-0.430
Other Europe	-0.016	-0.041	-0.184	-0.336	-0.303	-0.212	-0.179	-0.179
Eurasia	**0.000**	**0.473**	**0.454**	**0.346**	**0.250**	**0.333**	**0.460**	**0.596**
Kazakhstan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Russia	0.000	0.473	0.460	0.560	0.461	0.460	0.460	0.596
Turkmenistan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ukraine	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Uzbekistan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other Eurasia	0.000	0.000	-0.005	-0.215	-0.211	-0.127	0.000	0.000
Middle East	**1.534**	**3.450**	**4.549**	**4.569**	**4.588**	**4.807**	**5.013**	**5.018**
Iran	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Qatar	0.957	2.674	3.653	3.652	3.654	3.871	4.038	4.042
Oman	0.325	0.406	0.413	0.413	0.414	0.414	0.440	0.441
Saudi Arabia	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
United Arab Emirates	0.252	0.273	0.226	0.222	0.227	0.227	0.240	0.240
Other Middle East	0.000	0.097	0.257	0.282	0.294	0.294	0.294	0.295
Africa	**1.607**	**2.062**	**1.677**	**1.430**	**1.825**	**2.171**	**2.177**	**2.193**
Algeria	0.907	0.682	0.807	0.607	0.790	0.816	0.817	0.818
Egypt	0.245	0.343	0.000	0.000	0.000	0.000	0.000	0.000
Nigeria	0.425	0.844	0.685	0.471	0.650	0.913	0.918	0.920
Other Africa	0.031	0.194	0.185	0.351	0.385	0.442	0.442	0.454
Asia & Oceania	**-1.413**	**-2.957**	**-4.511**	**-4.404**	**-5.163**	**-6.612**	**-7.544**	**-8.349**
Australia	0.524	0.895	2.506	3.962	4.589	4.595	4.603	4.610
China	0.000	-0.444	-1.559	-2.677	-3.571	-3.791	-3.240	-3.096
India	-0.208	-0.421	-0.872	-0.966	-1.176	-1.707	-2.716	-3.786
Indonesia	1.111	1.107	0.827	1.232	1.285	1.285	1.288	1.410
Japan	-2.789	-3.426	-3.974	-4.119	-4.010	-3.906	-3.958	-3.918
Malaysia	1.007	1.078	1.080	1.257	1.258	1.258	1.259	1.260
Myanmar	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Pakistan	0.000	0.000	0.000	0.000	-0.190	-0.532	-0.945	-1.421
Singapore	0.000	0.000	-0.100	-0.101	-0.100	-0.100	-0.100	-0.100
South Korea	-1.049	-1.541	-2.256	-2.744	-2.941	-3.089	-3.125	-3.077
Thailand	0.000	0.000	-0.083	-0.084	-0.083	-0.083	-0.083	-0.140
Other Asia & Oceania	-0.008	-0.205	-0.081	-0.163	-0.225	-0.543	-0.528	-0.091
World	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**

[48] A negative number denotes the country is a net *importer*.

Ref_HRR Case (Net LNG Exports)(tcf)

	2005	2010	2015	2020	2025	2030	2035	2040
North America	**-0.551**	**-0.637**	**-0.404**	**1.366**	**1.962**	**1.984**	**1.989**	**2.599**
Canada	0.000	-0.072	-0.096	-0.090	-0.089	-0.089	-0.089	0.389
Mexico	0.000	-0.198	-0.253	-0.257	-0.253	-0.253	-0.253	-0.253
United States	-0.551	-0.366	-0.054	1.713	2.304	2.325	2.331	2.463
Central & South America	**0.463**	**0.464**	**0.402**	**0.071**	**0.129**	**0.188**	**0.300**	**0.298**
Argentina	0.000	-0.062	-0.091	-0.092	-0.091	-0.091	-0.091	-0.091
Brazil	0.000	-0.096	-0.113	-0.149	-0.113	-0.113	-0.113	-0.113
Chile	0.000	-0.106	-0.162	-0.202	-0.199	-0.199	-0.199	-0.199
Colombia	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Peru	0.000	0.064	0.183	0.181	0.181	0.182	0.182	0.183
Trinidad and Tobago	0.495	0.719	0.669	0.471	0.514	0.597	0.729	0.731
Venezuela	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other Central & South America	-0.032	-0.055	-0.084	-0.138	-0.164	-0.188	-0.208	-0.212
Europe	**-1.640**	**-2.856**	**-2.170**	**-3.260**	**-3.256**	**-2.788**	**-2.337**	**-2.146**
Austria	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Belgium	-0.103	-0.203	-0.094	-0.096	-0.094	-0.094	-0.094	-0.094
France	-0.442	-0.483	-0.389	-0.537	-0.651	-0.664	-0.523	-0.425
Germany	0.000	0.000	-0.062	-0.063	-0.062	-0.062	-0.062	-0.062
Italy	-0.086	-0.315	-0.127	-0.494	-0.454	-0.403	-0.258	-0.191
Netherlands	0.000	0.000	-0.145	-0.147	-0.144	-0.151	-0.144	-0.144
Norway	0.000	0.166	0.184	0.107	0.181	0.184	0.185	0.185
Poland	0.000	0.000	0.000	-0.148	-0.145	0.000	0.000	0.000
Portugal	-0.054	-0.104	-0.119	-0.121	-0.119	-0.119	-0.119	-0.119
Romania	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Spain	-0.753	-0.955	-0.674	-0.684	-0.680	-0.701	-0.700	-0.673
Turkey	-0.168	-0.275	-0.129	-0.285	-0.279	-0.145	-0.015	-0.015
United Kingdom	-0.018	-0.647	-0.431	-0.437	-0.473	-0.431	-0.430	-0.430
Other Europe	-0.016	-0.041	-0.184	-0.355	-0.336	-0.201	-0.176	-0.176
Eurasia	**0.000**	**0.473**	**0.456**	**0.362**	**0.248**	**0.368**	**0.483**	**0.595**
Kazakhstan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Russia	0.000	0.473	0.460	0.578	0.460	0.460	0.483	0.595
Turkmenistan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ukraine	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Uzbekistan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other Eurasia	0.000	0.000	-0.004	-0.216	-0.211	-0.091	0.000	0.000
Middle East	**1.534**	**3.450**	**4.549**	**4.570**	**4.588**	**4.832**	**5.013**	**5.019**
Iran	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Qatar	0.957	2.674	3.653	3.652	3.653	3.896	4.039	4.042
Oman	0.325	0.406	0.413	0.413	0.414	0.414	0.440	0.441
Saudi Arabia	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
United Arab Emirates	0.252	0.273	0.226	0.222	0.227	0.227	0.240	0.240
Other Middle East	0.000	0.097	0.256	0.283	0.294	0.294	0.295	0.295
Africa	**1.607**	**2.062**	**1.681**	**1.427**	**1.743**	**2.172**	**2.179**	**2.193**
Algeria	0.907	0.682	0.807	0.607	0.748	0.815	0.817	0.818
Egypt	0.245	0.343	0.000	0.000	0.000	0.000	0.000	0.000
Nigeria	0.425	0.844	0.688	0.472	0.608	0.914	0.918	0.921
Other Africa	0.031	0.194	0.185	0.347	0.386	0.443	0.443	0.455
Asia & Oceania	**-1.413**	**-2.957**	**-4.514**	**-4.535**	**-5.414**	**-6.757**	**-7.627**	**-8.560**
Australia	0.524	0.895	2.506	3.937	4.587	4.595	4.603	4.610
China	0.000	-0.444	-1.561	-2.725	-3.684	-3.900	-3.332	-3.193
India	-0.208	-0.421	-0.873	-0.975	-1.212	-1.684	-2.679	-3.802
Indonesia	1.111	1.107	0.826	1.208	1.284	1.286	1.288	1.415
Japan	-2.789	-3.426	-3.974	-4.127	-4.025	-3.900	-3.955	-3.914
Malaysia	1.007	1.078	1.083	1.256	1.258	1.258	1.259	1.260
Myanmar	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Pakistan	0.000	0.000	0.000	0.000	-0.218	-0.543	-0.937	-1.420
Singapore	0.000	0.000	-0.100	-0.101	-0.100	-0.099	-0.100	-0.100
South Korea	-1.049	-1.541	-2.256	-2.749	-2.950	-3.085	-3.121	-3.071
Thailand	0.000	0.000	-0.083	-0.084	-0.083	-0.083	-0.083	-0.203
Other Asia & Oceania	-0.008	-0.205	-0.082	-0.175	-0.271	-0.603	-0.573	-0.143
World	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**

Ref_LRR Case (Net LNG Exports)(tcf)

	2005	2010	2015	2020	2025	2030	2035	2040
North America	**-0.551**	**-0.637**	**-0.404**	**0.893**	**0.898**	**1.072**	**1.482**	**2.024**
Canada	0.000	-0.072	-0.096	-0.090	-0.089	-0.089	-0.089	0.378
Mexico	0.000	-0.198	-0.253	-0.256	-0.253	-0.253	-0.253	-0.253
United States	-0.551	-0.366	-0.054	1.238	1.240	1.413	1.823	1.899
Central & South America	**0.463**	**0.464**	**0.407**	**0.106**	**0.202**	**0.230**	**0.300**	**0.295**
Argentina	0.000	-0.062	-0.091	-0.092	-0.091	-0.091	-0.091	-0.091
Brazil	0.000	-0.096	-0.113	-0.114	-0.113	-0.113	-0.113	-0.113
Chile	0.000	-0.106	-0.162	-0.202	-0.199	-0.199	-0.199	-0.199
Colombia	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Peru	0.000	0.064	0.183	0.181	0.182	0.182	0.182	0.183
Trinidad and Tobago	0.495	0.719	0.674	0.471	0.585	0.636	0.728	0.730
Venezuela	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other Central & South America	-0.032	-0.055	-0.084	-0.138	-0.161	-0.185	-0.208	-0.214
Europe	**-1.640**	**-2.856**	**-2.175**	**-3.066**	**-2.989**	**-2.620**	**-2.346**	**-2.134**
Austria	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Belgium	-0.103	-0.203	-0.094	-0.096	-0.094	-0.094	-0.094	-0.094
France	-0.442	-0.483	-0.389	-0.472	-0.562	-0.597	-0.530	-0.419
Germany	0.000	0.000	-0.062	-0.063	-0.062	-0.062	-0.062	-0.062
Italy	-0.086	-0.315	-0.130	-0.407	-0.403	-0.389	-0.255	-0.180
Netherlands	0.000	0.000	-0.144	-0.146	-0.144	-0.144	-0.144	-0.144
Norway	0.000	0.166	0.184	0.113	0.181	0.184	0.184	0.185
Poland	0.000	0.000	0.000	-0.147	-0.144	0.000	0.000	0.000
Portugal	-0.054	-0.104	-0.119	-0.120	-0.119	-0.119	-0.119	-0.119
Romania	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Spain	-0.753	-0.955	-0.673	-0.681	-0.673	-0.693	-0.700	-0.673
Turkey	-0.168	-0.275	-0.131	-0.283	-0.261	-0.091	-0.015	-0.015
United Kingdom	-0.018	-0.647	-0.431	-0.436	-0.431	-0.430	-0.430	-0.431
Other Europe	-0.016	-0.041	-0.184	-0.327	-0.278	-0.184	-0.181	-0.181
Eurasia	**0.000**	**0.473**	**0.445**	**0.335**	**0.248**	**0.402**	**0.483**	**0.596**
Kazakhstan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Russia	0.000	0.473	0.460	0.549	0.458	0.461	0.483	0.596
Turkmenistan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ukraine	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Uzbekistan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other Eurasia	0.000	0.000	-0.014	-0.214	-0.210	-0.059	0.000	0.000
Middle East	**1.534**	**3.450**	**4.549**	**4.574**	**4.589**	**4.867**	**5.013**	**5.023**
Iran	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Qatar	0.957	2.674	3.653	3.652	3.654	3.931	4.039	4.043
Oman	0.325	0.406	0.413	0.413	0.414	0.414	0.440	0.445
Saudi Arabia	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
United Arab Emirates	0.252	0.273	0.226	0.222	0.227	0.227	0.240	0.240
Other Middle East	0.000	0.097	0.257	0.287	0.294	0.294	0.295	0.295
Africa	**1.607**	**2.062**	**1.685**	**1.447**	**1.935**	**2.172**	**2.178**	**2.221**
Algeria	0.907	0.682	0.807	0.607	0.807	0.816	0.817	0.818
Egypt	0.245	0.343	0.000	0.000	0.000	0.000	0.000	0.000
Nigeria	0.425	0.844	0.693	0.470	0.742	0.914	0.918	0.920
Other Africa	0.031	0.194	0.185	0.369	0.385	0.442	0.442	0.483
Asia & Oceania	**-1.413**	**-2.957**	**-4.509**	**-4.288**	**-4.882**	**-6.123**	**-7.110**	**-8.026**
Australia	0.524	0.895	2.506	3.978	4.590	4.596	4.604	4.610
China	0.000	-0.444	-1.561	-2.641	-3.437	-3.554	-2.998	-2.914
India	-0.208	-0.421	-0.870	-0.950	-1.156	-1.638	-2.698	-3.785
Indonesia	1.111	1.107	0.828	1.248	1.285	1.286	1.288	1.422
Japan	-2.789	-3.426	-3.974	-4.112	-4.004	-3.893	-3.953	-3.920
Malaysia	1.007	1.078	1.082	1.257	1.258	1.259	1.259	1.260
Myanmar	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Pakistan	0.000	0.000	0.000	0.000	-0.152	-0.484	-0.941	-1.422
Singapore	0.000	0.000	-0.100	-0.101	-0.100	-0.100	-0.100	-0.100
South Korea	-1.049	-1.541	-2.256	-2.739	-2.937	-3.078	-3.116	-3.071
Thailand	0.000	0.000	-0.083	-0.084	-0.083	-0.083	-0.083	-0.113
Other Asia & Oceania	-0.008	-0.205	-0.080	-0.144	-0.145	-0.433	-0.373	0.007
World	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**

Ref_Hi-D Case (Net LNG Exports)(tcf)

	2005	2010	2015	2020	2025	2030	2035	2040
North America	**-0.551**	**-0.637**	**-0.404**	**1.021**	**1.239**	**1.878**	**1.978**	**2.392**
Canada	0.000	-0.072	-0.096	-0.090	-0.089	-0.089	-0.089	0.323
Mexico	0.000	-0.198	-0.253	-0.256	-0.253	-0.253	-0.253	-0.253
United States	-0.551	-0.366	-0.054	1.367	1.581	2.220	2.319	2.322
Central & South America	**0.463**	**0.464**	**0.403**	**0.102**	**0.173**	**0.166**	**0.291**	**0.299**
Argentina	0.000	-0.062	-0.091	-0.092	-0.091	-0.091	-0.091	-0.091
Brazil	0.000	-0.096	-0.113	-0.119	-0.113	-0.113	-0.113	-0.113
Chile	0.000	-0.106	-0.162	-0.202	-0.199	-0.199	-0.199	-0.199
Colombia	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Peru	0.000	0.064	0.183	0.181	0.182	0.182	0.182	0.183
Trinidad and Tobago	0.495	0.719	0.671	0.471	0.557	0.574	0.720	0.730
Venezuela	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.001
Other Central & South America	-0.032	-0.055	-0.084	-0.137	-0.163	-0.187	-0.209	-0.212
Europe	**-1.640**	**-2.856**	**-2.174**	**-3.112**	**-3.043**	**-2.787**	**-2.349**	**-2.156**
Austria	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Belgium	-0.103	-0.203	-0.094	-0.096	-0.094	-0.094	-0.094	-0.094
France	-0.442	-0.483	-0.389	-0.490	-0.581	-0.657	-0.525	-0.427
Germany	0.000	0.000	-0.062	-0.063	-0.062	-0.062	-0.062	-0.062
Italy	-0.086	-0.315	-0.129	-0.420	-0.403	-0.403	-0.261	-0.192
Netherlands	0.000	0.000	-0.144	-0.146	-0.144	-0.146	-0.144	-0.144
Norway	0.000	0.166	0.184	0.106	0.181	0.184	0.184	0.185
Poland	0.000	0.000	0.000	-0.147	-0.144	0.000	0.000	0.000
Portugal	-0.054	-0.104	-0.119	-0.120	-0.119	-0.119	-0.119	-0.119
Romania	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Spain	-0.753	-0.955	-0.674	-0.682	-0.673	-0.702	-0.699	-0.673
Turkey	-0.168	-0.275	-0.131	-0.284	-0.279	-0.149	-0.015	-0.015
United Kingdom	-0.018	-0.647	-0.431	-0.436	-0.430	-0.434	-0.430	-0.430
Other Europe	-0.016	-0.041	-0.184	-0.333	-0.295	-0.204	-0.184	-0.184
Eurasia	**0.000**	**0.473**	**0.451**	**0.345**	**0.245**	**0.351**	**0.460**	**0.595**
Kazakhstan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Russia	0.000	0.473	0.460	0.559	0.456	0.460	0.460	0.595
Turkmenistan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ukraine	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Uzbekistan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other Eurasia	0.000	0.000	-0.009	-0.215	-0.210	-0.108	0.000	0.000
Middle East	**1.534**	**3.450**	**4.549**	**4.572**	**4.589**	**4.820**	**5.013**	**5.020**
Iran	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Qatar	0.957	2.674	3.653	3.652	3.654	3.884	4.039	4.042
Oman	0.325	0.406	0.413	0.413	0.414	0.414	0.440	0.441
Saudi Arabia	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
United Arab Emirates	0.252	0.273	0.226	0.222	0.227	0.227	0.240	0.240
Other Middle East	0.000	0.097	0.257	0.285	0.294	0.294	0.295	0.295
Africa	**1.607**	**2.062**	**1.682**	**1.438**	**1.891**	**2.171**	**2.177**	**2.206**
Algeria	0.907	0.682	0.807	0.607	0.807	0.816	0.817	0.818
Egypt	0.245	0.343	0.000	0.000	0.000	0.000	0.000	0.000
Nigeria	0.425	0.844	0.690	0.471	0.698	0.914	0.918	0.921
Other Africa	0.031	0.194	0.185	0.360	0.386	0.442	0.442	0.467
Asia & Oceania	**-1.413**	**-2.957**	**-4.508**	**-4.366**	**-5.095**	**-6.601**	**-7.570**	**-8.357**
Australia	0.524	0.895	2.506	3.969	4.590	4.595	4.603	4.610
China	0.000	-0.444	-1.561	-2.666	-3.544	-3.801	-3.321	-3.094
India	-0.208	-0.421	-0.871	-0.967	-1.169	-1.702	-2.696	-3.788
Indonesia	1.111	1.107	0.828	1.243	1.287	1.287	1.290	1.420
Japan	-2.789	-3.426	-3.974	-4.117	-4.004	-3.902	-3.953	-3.913
Malaysia	1.007	1.078	1.085	1.257	1.258	1.258	1.259	1.260
Myanmar	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Pakistan	0.000	0.000	0.000	0.000	-0.190	-0.532	-0.941	-1.420
Singapore	0.000	0.000	-0.100	-0.101	-0.100	-0.099	-0.100	-0.100
South Korea	-1.049	-1.541	-2.256	-2.742	-2.937	-3.085	-3.120	-3.070
Thailand	0.000	0.000	-0.083	-0.084	-0.083	-0.083	-0.083	-0.176
Other Asia & Oceania	-0.008	-0.205	-0.081	-0.157	-0.205	-0.537	-0.509	-0.086
World	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**

LNG12_Ref Case (Net LNG Exports)(tcf)

	2005	2010	2015	2020	2025	2030	2035	2040
North America	**-0.551**	**-0.637**	**-0.398**	**1.628**	**1.989**	**2.607**	**4.259**	**4.644**
Canada	0.000	-0.072	-0.095	-0.089	-0.088	-0.012	0.266	0.270
Mexico	0.000	-0.198	-0.250	-0.253	-0.250	-0.255	-0.083	0.288
United States	-0.551	-0.366	-0.053	1.969	2.326	2.874	4.075	4.086
Central & South America	**0.463**	**0.464**	**0.403**	**0.148**	**0.358**	**0.351**	**0.356**	**0.356**
Argentina	0.000	-0.062	-0.090	-0.091	-0.090	-0.092	-0.094	-0.094
Brazil	0.000	-0.096	-0.112	-0.113	-0.111	-0.114	-0.116	-0.117
Chile	0.000	-0.106	-0.160	-0.199	-0.197	-0.201	-0.205	-0.206
Colombia	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Peru	0.000	0.064	0.183	0.182	0.182	0.183	0.204	0.207
Trinidad and Tobago	0.495	0.719	0.664	0.499	0.724	0.731	0.733	0.734
Venezuela	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other Central & South America	-0.032	-0.055	-0.083	-0.130	-0.149	-0.157	-0.166	-0.168
Europe	**-1.640**	**-2.856**	**-2.159**	**-2.887**	**-2.401**	**-2.060**	**-2.111**	**-2.122**
Austria	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Belgium	-0.103	-0.203	-0.093	-0.094	-0.093	-0.095	-0.098	-0.099
France	-0.442	-0.483	-0.384	-0.438	-0.431	-0.390	-0.399	-0.401
Germany	0.000	0.000	-0.062	-0.062	-0.062	-0.063	-0.064	-0.064
Italy	-0.086	-0.315	-0.132	-0.402	-0.275	-0.124	-0.127	-0.127
Netherlands	0.000	0.000	-0.143	-0.144	-0.143	-0.145	-0.149	-0.149
Norway	0.000	0.166	0.184	0.165	0.184	0.185	0.185	0.185
Poland	0.000	0.000	0.000	-0.145	-0.142	0.000	0.000	0.000
Portugal	-0.054	-0.104	-0.117	-0.119	-0.117	-0.120	-0.122	-0.123
Romania	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Spain	-0.753	-0.955	-0.661	-0.668	-0.660	-0.674	-0.689	-0.693
Turkey	-0.168	-0.275	-0.144	-0.279	-0.058	-0.015	-0.015	-0.015
United Kingdom	-0.018	-0.647	-0.425	-0.430	-0.425	-0.433	-0.443	-0.445
Other Europe	-0.016	-0.041	-0.182	-0.272	-0.181	-0.185	-0.189	-0.190
Eurasia	**0.000**	**0.473**	**0.460**	**0.276**	**0.444**	**0.602**	**0.602**	**0.603**
Kazakhstan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Russia	0.000	0.473	0.460	0.487	0.565	0.602	0.602	0.603
Turkmenistan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ukraine	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Uzbekistan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other Eurasia	0.000	0.000	0.000	-0.211	-0.121	0.000	0.000	0.000
Middle East	**1.534**	**3.450**	**4.551**	**4.585**	**4.715**	**5.015**	**5.018**	**5.022**
Iran	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Qatar	0.957	2.674	3.653	3.652	3.776	4.040	4.044	4.048
Oman	0.325	0.406	0.413	0.413	0.415	0.441	0.441	0.442
Saudi Arabia	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
United Arab Emirates	0.252	0.273	0.227	0.226	0.228	0.239	0.238	0.238
Other Middle East	0.000	0.097	0.258	0.294	0.295	0.295	0.294	0.294
Africa	**1.607**	**2.062**	**1.702**	**1.569**	**2.168**	**2.180**	**2.441**	**2.959**
Algeria	0.907	0.682	0.815	0.678	0.816	0.819	0.957	1.064
Egypt	0.245	0.343	0.000	0.000	0.000	0.000	0.000	0.000
Nigeria	0.425	0.844	0.702	0.502	0.910	0.917	0.921	0.946
Other Africa	0.031	0.194	0.185	0.389	0.442	0.443	0.562	0.949
Asia & Oceania	**-1.413**	**-2.957**	**-4.558**	**-5.319**	**-7.273**	**-8.695**	**-10.564**	**-11.464**
Australia	0.524	0.895	2.506	4.299	4.594	4.609	4.718	5.520
China	0.000	-0.444	-1.554	-3.653	-5.407	-6.754	-7.748	-8.004
India	-0.208	-0.421	-0.866	-0.993	-1.404	-1.723	-2.265	-3.328
Indonesia	1.111	1.107	0.896	1.282	1.289	1.316	1.454	1.470
Japan	-2.789	-3.426	-4.145	-4.475	-4.319	-4.221	-4.253	-4.033
Malaysia	1.007	1.078	1.087	1.257	1.259	1.481	1.505	1.505
Myanmar	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Pakistan	0.000	0.000	0.000	0.000	0.000	-0.083	-0.685	-1.391
Singapore	0.000	0.000	-0.098	-0.099	-0.098	-0.100	-0.103	-0.103
South Korea	-1.049	-1.541	-2.226	-2.681	-2.870	-2.997	-3.073	-2.992
Thailand	0.000	0.000	-0.082	-0.083	-0.082	-0.084	-0.085	-0.086
Other Asia & Oceania	-0.008	-0.205	-0.075	-0.174	-0.235	-0.140	-0.029	-0.022
World	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**

LNG12_HRR Case (Net LNG Exports)(tcf)

	2005	2010	2015	2020	2025	2030	2035	2040
North America	**-0.551**	**-0.637**	**-0.404**	**1.952**	**1.987**	**3.309**	**5.746**	**6.470**
Canada	0.000	-0.072	-0.096	-0.089	-0.089	-0.068	0.233	0.273
Mexico	0.000	-0.198	-0.253	-0.254	-0.253	-0.253	-0.164	0.246
United States	-0.551	-0.366	-0.054	2.295	2.328	3.629	5.677	5.951
Central & South America	**0.463**	**0.464**	**0.422**	**0.202**	**0.359**	**0.361**	**0.360**	**0.369**
Argentina	0.000	-0.062	-0.091	-0.091	-0.091	-0.091	-0.091	-0.091
Brazil	0.000	-0.096	-0.113	-0.113	-0.113	-0.113	-0.113	-0.113
Chile	0.000	-0.106	-0.162	-0.200	-0.199	-0.199	-0.199	-0.199
Colombia	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Peru	0.000	0.064	0.183	0.182	0.182	0.183	0.200	0.205
Trinidad and Tobago	0.495	0.719	0.689	0.553	0.729	0.731	0.732	0.734
Venezuela	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other Central & South America	-0.032	-0.055	-0.084	-0.129	-0.149	-0.151	-0.168	-0.167
Europe	**-1.640**	**-2.856**	**-2.155**	**-2.918**	**-2.247**	**-2.040**	**-2.041**	**-2.040**
Austria	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Belgium	-0.103	-0.203	-0.095	-0.095	-0.095	-0.094	-0.095	-0.094
France	-0.442	-0.483	-0.388	-0.440	-0.402	-0.387	-0.387	-0.387
Germany	0.000	0.000	-0.062	-0.063	-0.062	-0.062	-0.062	-0.062
Italy	-0.086	-0.315	-0.123	-0.403	-0.241	-0.123	-0.123	-0.123
Netherlands	0.000	0.000	-0.145	-0.145	-0.144	-0.144	-0.144	-0.144
Norway	0.000	0.166	0.184	0.141	0.184	0.185	0.185	0.185
Poland	0.000	0.000	0.000	-0.146	-0.072	0.000	0.000	0.000
Portugal	-0.054	-0.104	-0.119	-0.119	-0.119	-0.119	-0.119	-0.119
Romania	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Spain	-0.753	-0.955	-0.668	-0.670	-0.668	-0.667	-0.668	-0.667
Turkey	-0.168	-0.275	-0.125	-0.280	-0.015	-0.015	-0.015	-0.015
United Kingdom	-0.018	-0.647	-0.431	-0.431	-0.430	-0.430	-0.430	-0.430
Other Europe	-0.016	-0.041	-0.184	-0.268	-0.184	-0.184	-0.184	-0.184
Eurasia	**0.000**	**0.473**	**0.460**	**0.271**	**0.512**	**0.596**	**0.597**	**0.598**
Kazakhstan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Russia	0.000	0.473	0.460	0.483	0.562	0.596	0.597	0.598
Turkmenistan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ukraine	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Uzbekistan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other Eurasia	0.000	0.000	0.000	-0.212	-0.051	0.000	0.000	0.000
Middle East	**1.534**	**3.450**	**4.549**	**4.584**	**4.710**	**5.015**	**5.020**	**5.025**
Iran	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Qatar	0.957	2.674	3.653	3.652	3.774	4.039	4.043	4.047
Oman	0.325	0.406	0.413	0.413	0.415	0.441	0.441	0.442
Saudi Arabia	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
United Arab Emirates	0.252	0.273	0.227	0.226	0.227	0.240	0.240	0.240
Other Middle East	0.000	0.097	0.257	0.294	0.295	0.295	0.296	0.296
Africa	**1.607**	**2.062**	**1.702**	**1.512**	**2.168**	**2.179**	**2.268**	**2.650**
Algeria	0.907	0.682	0.815	0.639	0.816	0.819	0.836	0.922
Egypt	0.245	0.343	0.000	0.000	0.000	0.000	0.000	0.000
Nigeria	0.425	0.844	0.702	0.490	0.910	0.917	0.919	0.922
Other Africa	0.031	0.194	0.185	0.383	0.442	0.443	0.513	0.806
Asia & Oceania	**-1.413**	**-2.957**	**-4.573**	**-5.603**	**-7.489**	**-9.420**	**-11.950**	**-13.072**
Australia	0.524	0.895	2.506	4.308	4.596	4.609	4.652	5.241
China	0.000	-0.444	-1.520	-3.892	-5.637	-7.409	-8.917	-9.262
India	-0.208	-0.421	-0.831	-0.995	-1.300	-1.649	-2.316	-3.355
Indonesia	1.111	1.107	0.889	1.280	1.287	1.292	1.459	1.460
Japan	-2.789	-3.426	-4.194	-4.505	-4.375	-4.200	-4.201	-3.907
Malaysia	1.007	1.078	1.087	1.257	1.259	1.282	1.282	1.283
Myanmar	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Pakistan	0.000	0.000	0.000	0.000	0.000	-0.070	-0.699	-1.358
Singapore	0.000	0.000	-0.100	-0.100	-0.100	-0.100	-0.100	-0.099
South Korea	-1.049	-1.541	-2.246	-2.695	-2.895	-2.973	-2.988	-2.895
Thailand	0.000	0.000	-0.083	-0.083	-0.083	-0.083	-0.083	-0.083
Other Asia & Oceania	-0.008	-0.205	-0.082	-0.178	-0.244	-0.120	-0.040	-0.097
World	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**

LNG12_LRR Case (Net LNG Exports)(tcf)

	2005	2010	2015	2020	2025	2030	2035	2040
North America	**-0.551**	**-0.637**	**-0.404**	**1.339**	**1.981**	**2.165**	**2.708**	**3.137**
Canada	0.000	-0.072	-0.096	-0.089	-0.089	0.017	0.273	0.274
Mexico	0.000	-0.198	-0.253	-0.253	-0.253	-0.253	-0.005	0.407
United States	-0.551	-0.366	-0.054	1.681	2.322	2.401	2.439	2.456
Central & South America	**0.463**	**0.464**	**0.420**	**0.239**	**0.360**	**0.364**	**0.397**	**0.396**
Argentina	0.000	-0.062	-0.091	-0.091	-0.091	-0.091	-0.091	-0.091
Brazil	0.000	-0.096	-0.113	-0.113	-0.113	-0.113	-0.113	-0.113
Chile	0.000	-0.106	-0.162	-0.199	-0.199	-0.199	-0.199	-0.199
Colombia	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Peru	0.000	0.064	0.183	0.182	0.182	0.183	0.219	0.220
Trinidad and Tobago	0.495	0.719	0.687	0.587	0.729	0.732	0.734	0.735
Venezuela	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other Central & South America	-0.032	-0.055	-0.084	-0.126	-0.147	-0.148	-0.154	-0.156
Europe	**-1.640**	**-2.856**	**-2.155**	**-2.791**	**-2.239**	**-2.041**	**-2.040**	**-2.039**
Austria	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Belgium	-0.103	-0.203	-0.095	-0.095	-0.095	-0.095	-0.094	-0.094
France	-0.442	-0.483	-0.388	-0.413	-0.400	-0.387	-0.387	-0.387
Germany	0.000	0.000	-0.062	-0.062	-0.062	-0.062	-0.062	-0.062
Italy	-0.086	-0.315	-0.123	-0.382	-0.237	-0.123	-0.123	-0.123
Netherlands	0.000	0.000	-0.145	-0.144	-0.144	-0.144	-0.144	-0.144
Norway	0.000	0.166	0.184	0.174	0.184	0.185	0.186	0.186
Poland	0.000	0.000	0.000	-0.145	-0.070	0.000	0.000	0.000
Portugal	-0.054	-0.104	-0.119	-0.119	-0.119	-0.119	-0.119	-0.119
Romania	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Spain	-0.753	-0.955	-0.668	-0.668	-0.668	-0.668	-0.667	-0.667
Turkey	-0.168	-0.275	-0.125	-0.276	-0.015	-0.015	-0.015	-0.015
United Kingdom	-0.018	-0.647	-0.431	-0.430	-0.430	-0.430	-0.430	-0.430
Other Europe	-0.016	-0.041	-0.184	-0.230	-0.184	-0.184	-0.184	-0.184
Eurasia	**0.000**	**0.473**	**0.460**	**0.249**	**0.514**	**0.598**	**0.599**	**0.600**
Kazakhstan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Russia	0.000	0.473	0.460	0.460	0.562	0.598	0.599	0.600
Turkmenistan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ukraine	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Uzbekistan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other Eurasia	0.000	0.000	0.000	-0.211	-0.049	0.000	0.000	0.000
Middle East	**1.534**	**3.450**	**4.549**	**4.585**	**4.715**	**5.017**	**5.024**	**5.044**
Iran	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Qatar	0.957	2.674	3.653	3.652	3.777	4.040	4.046	4.049
Oman	0.325	0.406	0.413	0.413	0.416	0.441	0.442	0.442
Saudi Arabia	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
United Arab Emirates	0.252	0.273	0.227	0.226	0.227	0.240	0.240	0.240
Other Middle East	0.000	0.097	0.257	0.294	0.295	0.296	0.296	0.313
Africa	**1.607**	**2.062**	**1.703**	**1.633**	**2.168**	**2.181**	**2.741**	**3.360**
Algeria	0.907	0.682	0.815	0.720	0.816	0.820	1.173	1.267
Egypt	0.245	0.343	0.000	0.000	0.000	0.000	0.000	0.000
Nigeria	0.425	0.844	0.703	0.524	0.909	0.918	0.923	1.001
Other Africa	0.031	0.194	0.185	0.389	0.442	0.444	0.646	1.092
Asia & Oceania	**-1.413**	**-2.957**	**-4.573**	**-5.256**	**-7.499**	**-8.284**	**-9.429**	**-10.497**
Australia	0.524	0.895	2.506	4.488	4.597	4.612	4.911	5.687
China	0.000	-0.444	-1.522	-3.798	-5.653	-6.811	-7.700	-8.134
India	-0.208	-0.421	-0.834	-0.992	-1.298	-1.513	-1.995	-3.080
Indonesia	1.111	1.107	0.898	1.282	1.287	1.348	1.523	1.620
Japan	-2.789	-3.426	-4.197	-4.474	-4.373	-4.179	-4.085	-3.879
Malaysia	1.007	1.078	1.087	1.258	1.259	1.497	1.505	1.506
Myanmar	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Pakistan	0.000	0.000	0.000	0.000	0.000	-0.017	-0.564	-1.315
Singapore	0.000	0.000	-0.100	-0.100	-0.100	-0.100	-0.100	-0.099
South Korea	-1.049	-1.541	-2.246	-2.675	-2.894	-2.952	-2.958	-2.870
Thailand	0.000	0.000	-0.083	-0.083	-0.083	-0.083	-0.083	-0.083
Other Asia & Oceania	-0.008	-0.205	-0.083	-0.162	-0.241	-0.087	0.115	0.150
World	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**

LNG12_Hi-D Case (Net LNG Exports)(tcf)

	2005	2010	2015	2020	2025	2030	2035	2040
North America	**-0.551**	**-0.637**	**-0.404**	**1.525**	**1.983**	**2.394**	**3.528**	**3.940**
Canada	0.000	-0.072	-0.096	-0.089	-0.089	0.003	0.273	0.274
Mexico	0.000	-0.198	-0.253	-0.253	-0.253	-0.253	-0.033	0.373
United States	-0.551	-0.366	-0.054	1.867	2.324	2.645	3.287	3.294
Central & South America	**0.463**	**0.464**	**0.420**	**0.219**	**0.361**	**0.360**	**0.393**	**0.392**
Argentina	0.000	-0.062	-0.091	-0.091	-0.091	-0.091	-0.091	-0.091
Brazil	0.000	-0.096	-0.113	-0.113	-0.113	-0.113	-0.113	-0.113
Chile	0.000	-0.106	-0.162	-0.199	-0.199	-0.199	-0.199	-0.199
Colombia	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Peru	0.000	0.064	0.183	0.182	0.182	0.183	0.219	0.219
Trinidad and Tobago	0.495	0.719	0.688	0.567	0.729	0.732	0.734	0.734
Venezuela	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other Central & South America	-0.032	-0.055	-0.084	-0.127	-0.148	-0.152	-0.157	-0.159
Europe	**-1.640**	**-2.856**	**-2.154**	**-2.825**	**-2.253**	**-2.041**	**-2.039**	**-2.039**
Austria	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Belgium	-0.103	-0.203	-0.095	-0.095	-0.095	-0.094	-0.094	-0.094
France	-0.442	-0.483	-0.388	-0.415	-0.398	-0.387	-0.387	-0.387
Germany	0.000	0.000	-0.062	-0.062	-0.062	-0.062	-0.062	-0.062
Italy	-0.086	-0.315	-0.123	-0.402	-0.239	-0.123	-0.123	-0.123
Netherlands	0.000	0.000	-0.145	-0.144	-0.144	-0.144	-0.144	-0.144
Norway	0.000	0.166	0.184	0.173	0.184	0.185	0.186	0.186
Poland	0.000	0.000	0.000	-0.145	-0.083	0.000	0.000	0.000
Portugal	-0.054	-0.104	-0.119	-0.119	-0.119	-0.119	-0.119	-0.119
Romania	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Spain	-0.753	-0.955	-0.668	-0.668	-0.668	-0.668	-0.667	-0.667
Turkey	-0.168	-0.275	-0.124	-0.279	-0.015	-0.015	-0.015	-0.015
United Kingdom	-0.018	-0.647	-0.431	-0.430	-0.430	-0.430	-0.430	-0.430
Other Europe	-0.016	-0.041	-0.184	-0.239	-0.184	-0.184	-0.184	-0.183
Eurasia	**0.000**	**0.473**	**0.460**	**0.249**	**0.509**	**0.597**	**0.598**	**0.599**
Kazakhstan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Russia	0.000	0.473	0.460	0.460	0.562	0.597	0.598	0.599
Turkmenistan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ukraine	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Uzbekistan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other Eurasia	0.000	0.000	0.000	-0.211	-0.053	0.000	0.000	0.000
Middle East	**1.534**	**3.450**	**4.549**	**4.585**	**4.713**	**5.017**	**5.023**	**5.032**
Iran	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Qatar	0.957	2.674	3.653	3.652	3.777	4.040	4.045	4.048
Oman	0.325	0.406	0.413	0.413	0.415	0.441	0.442	0.442
Saudi Arabia	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
United Arab Emirates	0.252	0.273	0.227	0.226	0.227	0.240	0.240	0.240
Other Middle East	0.000	0.097	0.257	0.294	0.295	0.296	0.296	0.301
Africa	**1.607**	**2.062**	**1.698**	**1.584**	**2.169**	**2.180**	**2.557**	**3.096**
Algeria	0.907	0.682	0.815	0.693	0.816	0.819	1.046	1.123
Egypt	0.245	0.343	0.000	0.000	0.000	0.000	0.000	0.000
Nigeria	0.425	0.844	0.697	0.502	0.910	0.917	0.921	1.000
Other Africa	0.031	0.194	0.185	0.389	0.442	0.443	0.590	0.973
Asia & Oceania	**-1.413**	**-2.957**	**-4.569**	**-5.337**	**-7.482**	**-8.507**	**-10.059**	**-11.020**
Australia	0.524	0.895	2.506	4.446	4.597	4.612	4.812	5.594
China	0.000	-0.444	-1.521	-3.830	-5.640	-6.964	-8.020	-8.402
India	-0.208	-0.421	-0.830	-0.992	-1.296	-1.539	-2.070	-3.121
Indonesia	1.111	1.107	0.895	1.282	1.288	1.332	1.505	1.570
Japan	-2.789	-3.426	-4.195	-4.479	-4.371	-4.184	-4.096	-3.884
Malaysia	1.007	1.078	1.087	1.258	1.259	1.489	1.505	1.505
Myanmar	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Pakistan	0.000	0.000	0.000	0.000	0.000	-0.020	-0.609	-1.327
Singapore	0.000	0.000	-0.100	-0.100	-0.100	-0.100	-0.099	-0.099
South Korea	-1.049	-1.541	-2.246	-2.678	-2.894	-2.957	-2.965	-2.874
Thailand	0.000	0.000	-0.083	-0.083	-0.083	-0.083	-0.083	-0.083
Other Asia & Oceania	-0.008	-0.205	-0.083	-0.162	-0.241	-0.094	0.061	0.101
World	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**

LNG20_Ref Case (Net LNG Exports)(tcf)

	2005	2010	2015	2020	2025	2030	2035	2040
North America	**-0.551**	**-0.637**	**-0.404**	**1.974**	**2.172**	**4.510**	**6.722**	**7.812**
Canada	0.000	-0.072	-0.096	-0.089	-0.089	-0.089	-0.089	-0.089
Mexico	0.000	-0.198	-0.253	-0.253	-0.253	-0.253	-0.253	-0.252
United States	-0.551	-0.366	-0.054	2.315	2.513	4.852	7.063	8.153
Central & South America	**0.463**	**0.464**	**0.435**	**0.324**	**0.386**	**0.398**	**0.442**	**0.455**
Argentina	0.000	-0.062	-0.091	-0.091	-0.091	-0.091	-0.091	-0.091
Brazil	0.000	-0.096	-0.113	-0.113	-0.113	-0.113	-0.113	-0.113
Chile	0.000	-0.106	-0.162	-0.199	-0.199	-0.199	-0.199	-0.199
Colombia	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Peru	0.000	0.064	0.183	0.182	0.183	0.209	0.220	0.220
Trinidad and Tobago	0.495	0.719	0.704	0.661	0.732	0.733	0.772	0.773
Venezuela	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other Central & South America	-0.032	-0.055	-0.086	-0.115	-0.126	-0.142	-0.147	-0.136
Europe	**-1.640**	**-2.856**	**-2.124**	**-2.602**	**-2.041**	**-2.039**	**-2.037**	**-2.037**
Austria	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Belgium	-0.103	-0.203	-0.095	-0.095	-0.095	-0.094	-0.094	-0.094
France	-0.442	-0.483	-0.388	-0.414	-0.387	-0.387	-0.387	-0.387
Germany	0.000	0.000	-0.062	-0.062	-0.062	-0.062	-0.062	-0.062
Italy	-0.086	-0.315	-0.123	-0.284	-0.123	-0.123	-0.123	-0.123
Netherlands	0.000	0.000	-0.145	-0.144	-0.144	-0.144	-0.144	-0.144
Norway	0.000	0.166	0.184	0.181	0.185	0.186	0.186	0.187
Poland	0.000	0.000	0.000	-0.144	0.000	0.000	0.000	0.000
Portugal	-0.054	-0.104	-0.119	-0.119	-0.119	-0.119	-0.119	-0.119
Romania	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Spain	-0.753	-0.955	-0.668	-0.668	-0.667	-0.667	-0.667	-0.667
Turkey	-0.168	-0.275	-0.095	-0.214	-0.015	-0.015	-0.015	-0.015
United Kingdom	-0.018	-0.647	-0.431	-0.430	-0.430	-0.430	-0.430	-0.430
Other Europe	-0.016	-0.041	-0.184	-0.209	-0.184	-0.184	-0.183	-0.183
Eurasia	**0.000**	**0.473**	**0.460**	**0.250**	**0.597**	**0.598**	**0.600**	**0.601**
Kazakhstan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Russia	0.000	0.473	0.460	0.460	0.597	0.598	0.600	0.601
Turkmenistan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ukraine	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Uzbekistan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other Eurasia	0.000	0.000	0.000	-0.210	0.000	0.000	0.000	0.000
Middle East	**1.534**	**3.450**	**4.549**	**4.586**	**4.878**	**5.019**	**5.037**	**5.252**
Iran	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Qatar	0.957	2.674	3.653	3.652	3.906	4.042	4.047	4.053
Oman	0.325	0.406	0.413	0.413	0.441	0.441	0.442	0.443
Saudi Arabia	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
United Arab Emirates	0.252	0.273	0.227	0.227	0.235	0.240	0.240	0.241
Other Middle East	0.000	0.097	0.257	0.294	0.295	0.296	0.308	0.516
Africa	**1.607**	**2.062**	**1.725**	**1.804**	**2.177**	**2.300**	**2.845**	**3.049**
Algeria	0.907	0.682	0.815	0.757	0.819	0.896	1.305	1.399
Egypt	0.245	0.343	0.000	0.000	0.000	0.000	0.000	0.000
Nigeria	0.425	0.844	0.724	0.653	0.915	0.920	0.938	1.003
Other Africa	0.031	0.194	0.185	0.393	0.443	0.484	0.602	0.647
Asia & Oceania	**-1.413**	**-2.957**	**-4.641**	**-6.336**	**-8.169**	**-10.787**	**-13.608**	**-15.133**
Australia	0.524	0.895	2.506	4.566	4.608	4.625	4.812	4.881
China	0.000	-0.444	-1.576	-4.895	-6.781	-9.170	-10.955	-11.719
India	-0.208	-0.421	-0.848	-0.991	-1.126	-1.697	-2.578	-3.488
Indonesia	1.111	1.107	0.892	1.283	1.293	1.365	1.526	1.906
Japan	-2.789	-3.426	-4.193	-4.459	-4.276	-4.122	-4.070	-3.829
Malaysia	1.007	1.078	1.087	1.258	1.370	1.505	1.506	1.507
Myanmar	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Pakistan	0.000	0.000	0.000	0.000	0.000	0.000	-0.527	-1.197
Singapore	0.000	0.000	-0.100	-0.100	-0.100	-0.099	-0.099	-0.099
South Korea	-1.049	-1.541	-2.243	-2.728	-2.900	-3.005	-3.025	-2.910
Thailand	0.000	0.000	-0.083	-0.083	-0.083	-0.083	-0.083	-0.083
Other Asia & Oceania	-0.008	-0.205	-0.083	-0.185	-0.175	-0.107	-0.115	-0.102
World	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**

LNG20_HRR Case (Net LNG Exports)(tcf)

	2005	2010	2015	2020	2025	2030	2035	2040
North America	**-0.551**	**-0.637**	**-0.404**	**1.980**	**2.394**	**5.225**	**8.318**	**9.898**
Canada	0.000	-0.072	-0.096	-0.089	-0.089	-0.089	-0.089	-0.089
Mexico	0.000	-0.198	-0.253	-0.253	-0.253	-0.253	-0.253	-0.253
United States	-0.551	-0.366	-0.054	2.322	2.735	5.566	8.659	10.239
Central & South America	**0.463**	**0.464**	**0.421**	**0.300**	**0.387**	**0.370**	**0.392**	**0.396**
Argentina	0.000	-0.062	-0.091	-0.091	-0.091	-0.091	-0.091	-0.091
Brazil	0.000	-0.096	-0.113	-0.113	-0.113	-0.113	-0.113	-0.113
Chile	0.000	-0.106	-0.162	-0.199	-0.199	-0.199	-0.199	-0.199
Colombia	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Peru	0.000	0.064	0.183	0.182	0.183	0.191	0.220	0.220
Trinidad and Tobago	0.495	0.719	0.690	0.637	0.732	0.732	0.734	0.735
Venezuela	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other Central & South America	-0.032	-0.055	-0.086	-0.115	-0.125	-0.151	-0.158	-0.156
Europe	**-1.640**	**-2.856**	**-2.119**	**-2.610**	**-2.041**	**-2.039**	**-2.039**	**-2.038**
Austria	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Belgium	-0.103	-0.203	-0.095	-0.095	-0.095	-0.094	-0.094	-0.094
France	-0.442	-0.483	-0.388	-0.409	-0.387	-0.387	-0.387	-0.387
Germany	0.000	0.000	-0.062	-0.062	-0.062	-0.062	-0.062	-0.062
Italy	-0.086	-0.315	-0.123	-0.291	-0.123	-0.123	-0.123	-0.123
Netherlands	0.000	0.000	-0.145	-0.144	-0.144	-0.144	-0.144	-0.144
Norway	0.000	0.166	0.184	0.181	0.185	0.186	0.186	0.186
Poland	0.000	0.000	0.000	-0.144	0.000	0.000	0.000	0.000
Portugal	-0.054	-0.104	-0.119	-0.119	-0.119	-0.119	-0.119	-0.119
Romania	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Spain	-0.753	-0.955	-0.668	-0.668	-0.668	-0.667	-0.667	-0.667
Turkey	-0.168	-0.275	-0.090	-0.218	-0.015	-0.015	-0.015	-0.015
United Kingdom	-0.018	-0.647	-0.430	-0.430	-0.430	-0.430	-0.430	-0.430
Other Europe	-0.016	-0.041	-0.184	-0.210	-0.184	-0.184	-0.184	-0.183
Eurasia	**0.000**	**0.473**	**0.460**	**0.250**	**0.597**	**0.598**	**0.599**	**0.599**
Kazakhstan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Russia	0.000	0.473	0.460	0.460	0.597	0.598	0.599	0.599
Turkmenistan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ukraine	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Uzbekistan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other Eurasia	0.000	0.000	0.000	-0.210	0.000	0.000	0.000	0.000
Middle East	**1.534**	**3.450**	**4.549**	**4.586**	**4.862**	**5.018**	**5.023**	**5.105**
Iran	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Qatar	0.957	2.674	3.653	3.652	3.895	4.041	4.045	4.050
Oman	0.325	0.406	0.413	0.414	0.441	0.441	0.442	0.442
Saudi Arabia	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
United Arab Emirates	0.252	0.273	0.227	0.227	0.231	0.240	0.240	0.240
Other Middle East	0.000	0.097	0.257	0.294	0.295	0.296	0.296	0.373
Africa	**1.607**	**2.062**	**1.715**	**1.796**	**2.177**	**2.186**	**2.564**	**2.863**
Algeria	0.907	0.682	0.815	0.764	0.819	0.824	1.073	1.286
Egypt	0.245	0.343	0.000	0.000	0.000	0.000	0.000	0.000
Nigeria	0.425	0.844	0.714	0.640	0.915	0.918	0.921	1.001
Other Africa	0.031	0.194	0.185	0.393	0.443	0.444	0.570	0.576
Asia & Oceania	**-1.413**	**-2.957**	**-4.622**	**-6.303**	**-8.376**	**-11.358**	**-14.856**	**-16.823**
Australia	0.524	0.895	2.506	4.558	4.607	4.614	4.710	4.875
China	0.000	-0.444	-1.572	-4.861	-6.902	-9.548	-11.631	-12.447
India	-0.208	-0.421	-0.840	-0.991	-1.132	-1.767	-2.797	-3.932
Indonesia	1.111	1.107	0.893	1.282	1.292	1.295	1.400	1.663
Japan	-2.789	-3.426	-4.189	-4.455	-4.283	-4.150	-4.098	-3.871
Malaysia	1.007	1.078	1.087	1.258	1.331	1.505	1.505	1.505
Myanmar	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Pakistan	0.000	0.000	0.000	0.000	0.000	0.000	-0.606	-1.300
Singapore	0.000	0.000	-0.100	-0.100	-0.100	-0.099	-0.099	-0.099
South Korea	-1.049	-1.541	-2.242	-2.727	-2.904	-3.018	-3.045	-2.949
Thailand	0.000	0.000	-0.083	-0.083	-0.083	-0.083	-0.083	-0.083
Other Asia & Oceania	-0.008	-0.205	-0.082	-0.185	-0.201	-0.106	-0.113	-0.186
World	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**

LNG20_LRR Case (Net LNG Exports)(tcf)

	2005	2010	2015	2020	2025	2030	2035	2040
North America	**-0.551**	**-0.637**	**-0.404**	**1.738**	**2.036**	**3.688**	**5.362**	**6.239**
Canada	0.000	-0.072	-0.096	-0.089	-0.089	-0.089	-0.089	-0.089
Mexico	0.000	-0.198	-0.253	-0.253	-0.253	-0.253	-0.252	-0.252
United States	-0.551	-0.366	-0.054	2.079	2.377	4.029	5.703	6.580
Central & South America	**0.463**	**0.464**	**0.439**	**0.344**	**0.381**	**0.432**	**0.454**	**0.521**
Argentina	0.000	-0.062	-0.091	-0.091	-0.091	-0.091	-0.091	-0.091
Brazil	0.000	-0.096	-0.113	-0.113	-0.113	-0.113	-0.113	-0.113
Chile	0.000	-0.106	-0.162	-0.199	-0.199	-0.199	-0.199	-0.199
Colombia	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Peru	0.000	0.064	0.183	0.182	0.183	0.218	0.220	0.220
Trinidad and Tobago	0.495	0.719	0.705	0.683	0.732	0.747	0.773	0.774
Venezuela	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other Central & South America	-0.032	-0.055	-0.083	-0.118	-0.131	-0.130	-0.136	-0.071
Europe	**-1.640**	**-2.856**	**-2.128**	**-2.535**	**-2.041**	**-2.039**	**-2.038**	**-2.004**
Austria	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Belgium	-0.103	-0.203	-0.095	-0.095	-0.095	-0.094	-0.094	-0.094
France	-0.442	-0.483	-0.388	-0.395	-0.387	-0.387	-0.387	-0.387
Germany	0.000	0.000	-0.062	-0.062	-0.062	-0.062	-0.062	-0.062
Italy	-0.086	-0.315	-0.123	-0.257	-0.123	-0.123	-0.123	-0.123
Netherlands	0.000	0.000	-0.145	-0.144	-0.144	-0.144	-0.144	-0.144
Norway	0.000	0.166	0.184	0.181	0.185	0.186	0.187	0.219
Poland	0.000	0.000	0.000	-0.144	0.000	0.000	0.000	0.000
Portugal	-0.054	-0.104	-0.119	-0.119	-0.119	-0.119	-0.119	-0.119
Romania	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Spain	-0.753	-0.955	-0.668	-0.668	-0.667	-0.667	-0.667	-0.667
Turkey	-0.168	-0.275	-0.098	-0.199	-0.015	-0.015	-0.015	-0.015
United Kingdom	-0.018	-0.647	-0.431	-0.430	-0.430	-0.430	-0.430	-0.430
Other Europe	-0.016	-0.041	-0.184	-0.204	-0.184	-0.184	-0.183	-0.183
Eurasia	**0.000**	**0.473**	**0.460**	**0.253**	**0.597**	**0.599**	**0.601**	**0.621**
Kazakhstan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Russia	0.000	0.473	0.460	0.462	0.597	0.599	0.601	0.621
Turkmenistan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ukraine	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Uzbekistan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other Eurasia	0.000	0.000	0.000	-0.210	0.000	0.000	0.000	0.000
Middle East	**1.534**	**3.450**	**4.549**	**4.587**	**4.890**	**5.021**	**5.116**	**5.257**
Iran	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Qatar	0.957	2.674	3.653	3.653	3.917	4.043	4.049	4.056
Oman	0.325	0.406	0.413	0.414	0.441	0.441	0.442	0.443
Saudi Arabia	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
United Arab Emirates	0.252	0.273	0.227	0.227	0.237	0.240	0.240	0.241
Other Middle East	0.000	0.097	0.257	0.294	0.295	0.296	0.384	0.517
Africa	**1.607**	**2.062**	**1.728**	**1.879**	**2.178**	**2.470**	**3.023**	**3.056**
Algeria	0.907	0.682	0.815	0.807	0.819	1.007	1.397	1.401
Egypt	0.245	0.343	0.000	0.000	0.000	0.000	0.000	0.000
Nigeria	0.425	0.844	0.727	0.680	0.915	0.921	0.985	1.004
Other Africa	0.031	0.194	0.185	0.392	0.443	0.542	0.641	0.651
Asia & Oceania	**-1.413**	**-2.957**	**-4.643**	**-6.265**	**-8.040**	**-10.171**	**-12.518**	**-13.689**
Australia	0.524	0.895	2.506	4.588	4.608	4.647	4.862	4.885
China	0.000	-0.444	-1.571	-4.871	-6.690	-8.772	-10.303	-11.180
India	-0.208	-0.421	-0.848	-0.991	-1.125	-1.617	-2.438	-2.879
Indonesia	1.111	1.107	0.892	1.283	1.293	1.426	1.644	2.047
Japan	-2.789	-3.426	-4.196	-4.446	-4.274	-4.087	-4.044	-3.799
Malaysia	1.007	1.078	1.087	1.258	1.385	1.506	1.507	1.509
Myanmar	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Pakistan	0.000	0.000	0.000	0.000	0.000	0.000	-0.455	-1.123
Singapore	0.000	0.000	-0.100	-0.100	-0.100	-0.099	-0.099	-0.099
South Korea	-1.049	-1.541	-2.246	-2.720	-2.898	-2.993	-3.007	-2.885
Thailand	0.000	0.000	-0.083	-0.083	-0.083	-0.083	-0.083	-0.083
Other Asia & Oceania	-0.008	-0.205	-0.084	-0.184	-0.157	-0.099	-0.102	-0.082
World	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**

LNG20_Hi-D Case (Net LNG Exports)(tcf)

	2005	2010	2015	2020	2025	2030	2035	2040
North America	**-0.551**	**-0.637**	**-0.403**	**1.959**	**2.126**	**4.249**	**6.291**	**7.226**
Canada	0.000	-0.072	-0.096	-0.089	-0.089	-0.089	-0.089	-0.089
Mexico	0.000	-0.198	-0.253	-0.253	-0.253	-0.253	-0.253	-0.252
United States	-0.551	-0.366	-0.054	2.300	2.467	4.590	6.633	7.567
Central & South America	**0.463**	**0.464**	**0.434**	**0.311**	**0.382**	**0.406**	**0.443**	**0.468**
Argentina	0.000	-0.062	-0.091	-0.091	-0.091	-0.091	-0.091	-0.091
Brazil	0.000	-0.096	-0.113	-0.113	-0.113	-0.113	-0.113	-0.113
Chile	0.000	-0.106	-0.162	-0.199	-0.199	-0.199	-0.199	-0.199
Colombia	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Peru	0.000	0.064	0.183	0.182	0.183	0.216	0.220	0.220
Trinidad and Tobago	0.495	0.719	0.700	0.653	0.732	0.733	0.772	0.774
Venezuela	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other Central & South America	-0.032	-0.055	-0.083	-0.121	-0.130	-0.140	-0.146	-0.123
Europe	**-1.640**	**-2.856**	**-2.121**	**-2.584**	**-2.042**	**-2.039**	**-2.038**	**-2.036**
Austria	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Belgium	-0.103	-0.203	-0.095	-0.095	-0.095	-0.094	-0.094	-0.094
France	-0.442	-0.483	-0.387	-0.410	-0.387	-0.387	-0.387	-0.387
Germany	0.000	0.000	-0.062	-0.062	-0.062	-0.062	-0.062	-0.062
Italy	-0.086	-0.315	-0.123	-0.274	-0.123	-0.123	-0.123	-0.123
Netherlands	0.000	0.000	-0.144	-0.144	-0.144	-0.144	-0.144	-0.144
Norway	0.000	0.166	0.184	0.181	0.185	0.186	0.186	0.187
Poland	0.000	0.000	0.000	-0.144	0.000	0.000	0.000	0.000
Portugal	-0.054	-0.104	-0.119	-0.119	-0.119	-0.119	-0.119	-0.119
Romania	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Spain	-0.753	-0.955	-0.667	-0.668	-0.668	-0.667	-0.667	-0.666
Turkey	-0.168	-0.275	-0.094	-0.211	-0.015	-0.015	-0.015	-0.015
United Kingdom	-0.018	-0.647	-0.430	-0.430	-0.430	-0.430	-0.430	-0.430
Other Europe	-0.016	-0.041	-0.184	-0.208	-0.184	-0.184	-0.183	-0.183
Eurasia	**0.000**	**0.473**	**0.460**	**0.250**	**0.597**	**0.598**	**0.600**	**0.612**
Kazakhstan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Russia	0.000	0.473	0.460	0.460	0.597	0.598	0.600	0.612
Turkmenistan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ukraine	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Uzbekistan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other Eurasia	0.000	0.000	0.000	-0.210	0.000	0.000	0.000	0.000
Middle East	**1.534**	**3.450**	**4.549**	**4.586**	**4.883**	**5.020**	**5.064**	**5.254**
Iran	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Qatar	0.957	2.674	3.653	3.652	3.911	4.042	4.047	4.054
Oman	0.325	0.406	0.413	0.414	0.441	0.441	0.442	0.443
Saudi Arabia	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
United Arab Emirates	0.252	0.273	0.227	0.227	0.236	0.240	0.240	0.241
Other Middle East	0.000	0.097	0.257	0.294	0.295	0.296	0.335	0.517
Africa	**1.607**	**2.062**	**1.726**	**1.813**	**2.178**	**2.357**	**2.941**	**3.053**
Algeria	0.907	0.682	0.815	0.766	0.819	0.935	1.367	1.400
Egypt	0.245	0.343	0.000	0.000	0.000	0.000	0.000	0.000
Nigeria	0.425	0.844	0.725	0.658	0.915	0.920	0.944	1.004
Other Africa	0.031	0.194	0.185	0.389	0.443	0.502	0.630	0.649
Asia & Oceania	**-1.413**	**-2.957**	**-4.644**	**-6.335**	**-8.124**	**-10.591**	**-13.302**	**-14.577**
Australia	0.524	0.895	2.506	4.561	4.608	4.632	4.836	4.883
China	0.000	-0.444	-1.575	-4.892	-6.751	-9.057	-10.809	-11.526
India	-0.208	-0.421	-0.845	-0.991	-1.126	-1.670	-2.514	-3.301
Indonesia	1.111	1.107	0.893	1.283	1.293	1.393	1.555	2.001
Japan	-2.789	-3.426	-4.189	-4.457	-4.277	-4.110	-4.063	-3.815
Malaysia	1.007	1.078	1.087	1.258	1.374	1.506	1.506	1.508
Myanmar	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Pakistan	0.000	0.000	0.000	0.000	0.000	0.000	-0.504	-1.158
Singapore	0.000	0.000	-0.100	-0.100	-0.100	-0.100	-0.100	-0.099
South Korea	-1.049	-1.541	-2.242	-2.727	-2.900	-3.001	-3.020	-2.898
Thailand	0.000	0.000	-0.083	-0.083	-0.083	-0.083	-0.083	-0.083
Other Asia & Oceania	-0.008	-0.205	-0.097	-0.186	-0.162	-0.101	-0.105	-0.089
World	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**

LNG20_Ref12 Case (Net LNG Exports)(tcf)

	2005	2010	2015	2020	2025	2030	2035	2040
North America	**-0.551**	**-0.637**	**-0.404**	**1.978**	**2.179**	**3.847**	**3.960**	**3.973**
Canada	0.000	-0.072	-0.096	-0.089	-0.089	-0.089	-0.089	-0.089
Mexico	0.000	-0.198	-0.253	-0.253	-0.253	-0.253	-0.253	-0.252
United States	-0.551	-0.366	-0.054	2.319	2.521	4.188	4.301	4.314
Central & South America	**0.463**	**0.464**	**0.436**	**0.319**	**0.381**	**0.420**	**0.464**	**0.566**
Argentina	0.000	-0.062	-0.091	-0.091	-0.091	-0.091	-0.091	-0.091
Brazil	0.000	-0.096	-0.113	-0.113	-0.113	-0.113	-0.113	-0.113
Chile	0.000	-0.106	-0.162	-0.199	-0.199	-0.199	-0.199	-0.199
Colombia	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Peru	0.000	0.064	0.183	0.182	0.183	0.213	0.220	0.221
Trinidad and Tobago	0.495	0.719	0.703	0.659	0.732	0.742	0.774	0.776
Venezuela	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other Central & South America	-0.032	-0.055	-0.083	-0.118	-0.131	-0.132	-0.127	-0.028
Europe	**-1.640**	**-2.856**	**-2.125**	**-2.580**	**-2.041**	**-2.039**	**-2.023**	**-1.992**
Austria	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Belgium	-0.103	-0.203	-0.095	-0.095	-0.094	-0.094	-0.094	-0.094
France	-0.442	-0.483	-0.388	-0.409	-0.387	-0.387	-0.387	-0.387
Germany	0.000	0.000	-0.062	-0.062	-0.062	-0.062	-0.062	-0.062
Italy	-0.086	-0.315	-0.123	-0.275	-0.123	-0.123	-0.123	-0.123
Netherlands	0.000	0.000	-0.145	-0.144	-0.144	-0.144	-0.144	-0.144
Norway	0.000	0.166	0.184	0.181	0.185	0.186	0.201	0.232
Poland	0.000	0.000	0.000	-0.144	0.000	0.000	0.000	0.000
Portugal	-0.054	-0.104	-0.119	-0.119	-0.119	-0.119	-0.119	-0.119
Romania	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Spain	-0.753	-0.955	-0.668	-0.668	-0.667	-0.667	-0.667	-0.667
Turkey	-0.168	-0.275	-0.096	-0.208	-0.015	-0.015	-0.015	-0.015
United Kingdom	-0.018	-0.647	-0.431	-0.430	-0.430	-0.430	-0.430	-0.429
Other Europe	-0.016	-0.041	-0.184	-0.207	-0.184	-0.184	-0.183	-0.183
Eurasia	**0.000**	**0.473**	**0.460**	**0.250**	**0.597**	**0.599**	**0.610**	**0.620**
Kazakhstan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Russia	0.000	0.473	0.460	0.460	0.597	0.599	0.610	0.620
Turkmenistan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ukraine	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Uzbekistan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other Eurasia	0.000	0.000	0.000	-0.210	0.000	0.000	0.000	0.000
Middle East	**1.534**	**3.450**	**4.549**	**4.586**	**4.882**	**5.020**	**5.197**	**5.264**
Iran	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Qatar	0.957	2.674	3.653	3.652	3.910	4.043	4.051	4.061
Oman	0.325	0.406	0.413	0.414	0.441	0.441	0.443	0.444
Saudi Arabia	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
United Arab Emirates	0.252	0.273	0.227	0.227	0.235	0.240	0.240	0.241
Other Middle East	0.000	0.097	0.257	0.294	0.295	0.296	0.462	0.519
Africa	**1.607**	**2.062**	**1.714**	**1.803**	**2.177**	**2.422**	**3.049**	**3.062**
Algeria	0.907	0.682	0.815	0.778	0.819	0.989	1.399	1.404
Egypt	0.245	0.343	0.000	0.000	0.000	0.000	0.000	0.000
Nigeria	0.425	0.844	0.713	0.634	0.915	0.920	1.001	1.007
Other Africa	0.031	0.194	0.185	0.392	0.443	0.513	0.649	0.651
Asia & Oceania	**-1.413**	**-2.957**	**-4.629**	**-6.356**	**-8.176**	**-10.269**	**-11.257**	**-11.494**
Australia	0.524	0.895	2.506	4.570	4.608	4.637	4.878	4.894
China	0.000	-0.444	-1.566	-4.926	-6.787	-8.785	-9.566	-9.801
India	-0.208	-0.421	-0.846	-0.991	-1.124	-1.648	-2.278	-2.425
Indonesia	1.111	1.107	0.898	1.284	1.294	1.409	1.839	2.071
Japan	-2.789	-3.426	-4.195	-4.455	-4.273	-4.108	-4.014	-3.744
Malaysia	1.007	1.078	1.087	1.258	1.361	1.506	1.508	1.512
Myanmar	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Pakistan	0.000	0.000	0.000	0.000	0.000	0.000	-0.358	-0.924
Singapore	0.000	0.000	-0.100	-0.100	-0.100	-0.099	-0.099	-0.099
South Korea	-1.049	-1.541	-2.245	-2.726	-2.899	-2.996	-2.987	-2.837
Thailand	0.000	0.000	-0.083	-0.083	-0.083	-0.083	-0.083	-0.083
Other Asia & Oceania	-0.008	-0.205	-0.085	-0.186	-0.174	-0.101	-0.098	-0.055
World	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**

LNG20_HRR12 Case (Net LNG Exports)(tcf)

	2005	2010	2015	2020	2025	2030	2035	2040
North America	**-0.551**	**-0.637**	**-0.404**	**1.980**	**2.364**	**3.915**	**3.963**	**3.975**
Canada	0.000	-0.072	-0.096	-0.089	-0.089	-0.089	-0.089	-0.089
Mexico	0.000	-0.198	-0.253	-0.253	-0.253	-0.253	-0.253	-0.253
United States	-0.551	-0.366	-0.054	2.322	2.706	4.257	4.304	4.317
Central & South America	**0.463**	**0.464**	**0.432**	**0.320**	**0.381**	**0.424**	**0.471**	**0.566**
Argentina	0.000	-0.062	-0.091	-0.091	-0.091	-0.091	-0.091	-0.091
Brazil	0.000	-0.096	-0.113	-0.113	-0.113	-0.113	-0.113	-0.113
Chile	0.000	-0.106	-0.162	-0.199	-0.199	-0.199	-0.199	-0.199
Colombia	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Peru	0.000	0.064	0.183	0.182	0.183	0.215	0.220	0.221
Trinidad and Tobago	0.495	0.719	0.699	0.658	0.732	0.744	0.774	0.776
Venezuela	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other Central & South America	-0.032	-0.055	-0.084	-0.117	-0.130	-0.131	-0.121	-0.028
Europe	**-1.640**	**-2.856**	**-2.128**	**-2.584**	**-2.041**	**-2.040**	**-2.021**	**-1.995**
Austria	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Belgium	-0.103	-0.203	-0.095	-0.095	-0.095	-0.094	-0.094	-0.095
France	-0.442	-0.483	-0.388	-0.407	-0.387	-0.387	-0.387	-0.387
Germany	0.000	0.000	-0.062	-0.062	-0.062	-0.062	-0.062	-0.062
Italy	-0.086	-0.315	-0.123	-0.281	-0.123	-0.123	-0.123	-0.123
Netherlands	0.000	0.000	-0.145	-0.144	-0.144	-0.144	-0.144	-0.144
Norway	0.000	0.166	0.184	0.181	0.185	0.186	0.206	0.232
Poland	0.000	0.000	0.000	-0.144	0.000	0.000	0.000	0.000
Portugal	-0.054	-0.104	-0.119	-0.119	-0.119	-0.119	-0.119	-0.119
Romania	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Spain	-0.753	-0.955	-0.669	-0.668	-0.668	-0.668	-0.668	-0.668
Turkey	-0.168	-0.275	-0.098	-0.207	-0.015	-0.015	-0.015	-0.015
United Kingdom	-0.018	-0.647	-0.431	-0.430	-0.430	-0.430	-0.430	-0.430
Other Europe	-0.016	-0.041	-0.184	-0.207	-0.184	-0.184	-0.184	-0.184
Eurasia	**0.000**	**0.473**	**0.460**	**0.251**	**0.597**	**0.599**	**0.611**	**0.629**
Kazakhstan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Russia	0.000	0.473	0.460	0.461	0.597	0.599	0.611	0.629
Turkmenistan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ukraine	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Uzbekistan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other Eurasia	0.000	0.000	0.000	-0.210	0.000	0.000	0.000	0.000
Middle East	**1.534**	**3.450**	**4.549**	**4.587**	**4.869**	**5.020**	**5.190**	**5.264**
Iran	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Qatar	0.957	2.674	3.653	3.652	3.898	4.043	4.051	4.061
Oman	0.325	0.406	0.413	0.414	0.441	0.441	0.443	0.444
Saudi Arabia	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
United Arab Emirates	0.252	0.273	0.227	0.227	0.236	0.240	0.240	0.241
Other Middle East	0.000	0.097	0.257	0.294	0.295	0.296	0.456	0.519
Africa	**1.607**	**2.062**	**1.718**	**1.812**	**2.177**	**2.419**	**3.051**	**3.066**
Algeria	0.907	0.682	0.815	0.774	0.819	0.977	1.399	1.404
Egypt	0.245	0.343	0.000	0.000	0.000	0.000	0.000	0.000
Nigeria	0.425	0.844	0.718	0.648	0.915	0.921	1.002	1.007
Other Africa	0.031	0.194	0.185	0.390	0.443	0.521	0.650	0.655
Asia & Oceania	**-1.413**	**-2.957**	**-4.627**	**-6.366**	**-8.348**	**-10.336**	**-11.265**	**-11.506**
Australia	0.524	0.895	2.506	4.567	4.607	4.640	4.878	4.894
China	0.000	-0.444	-1.567	-4.934	-6.900	-8.845	-9.604	-9.824
India	-0.208	-0.421	-0.844	-0.992	-1.128	-1.651	-2.271	-2.430
Indonesia	1.111	1.107	0.896	1.284	1.294	1.410	1.866	2.101
Japan	-2.789	-3.426	-4.194	-4.454	-4.280	-4.106	-4.016	-3.749
Malaysia	1.007	1.078	1.087	1.258	1.340	1.506	1.509	1.512
Myanmar	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Pakistan	0.000	0.000	0.000	0.000	0.000	0.000	-0.349	-0.923
Singapore	0.000	0.000	-0.100	-0.100	-0.100	-0.099	-0.099	-0.100
South Korea	-1.049	-1.541	-2.245	-2.726	-2.904	-2.996	-2.988	-2.840
Thailand	0.000	0.000	-0.083	-0.083	-0.083	-0.083	-0.083	-0.083
Other Asia & Oceania	-0.008	-0.205	-0.084	-0.186	-0.194	-0.111	-0.108	-0.066
World	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**

LNG20_LRR12 Case (Net LNG Exports)(tcf)

	2005	2010	2015	2020	2025	2030	2035	2040
North America	**-0.551**	**-0.637**	**-0.404**	**1.758**	**2.040**	**3.440**	**3.958**	**3.970**
Canada	0.000	-0.072	-0.096	-0.089	-0.089	-0.089	-0.088	-0.088
Mexico	0.000	-0.198	-0.253	-0.253	-0.253	-0.253	-0.251	-0.251
United States	-0.551	-0.366	-0.054	2.099	2.381	3.781	4.297	4.309
Central & South America	**0.463**	**0.464**	**0.436**	**0.331**	**0.380**	**0.441**	**0.466**	**0.564**
Argentina	0.000	-0.062	-0.091	-0.091	-0.091	-0.091	-0.090	-0.090
Brazil	0.000	-0.096	-0.113	-0.113	-0.113	-0.113	-0.112	-0.112
Chile	0.000	-0.106	-0.162	-0.199	-0.199	-0.199	-0.198	-0.198
Colombia	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Peru	0.000	0.064	0.183	0.182	0.183	0.219	0.221	0.222
Trinidad and Tobago	0.495	0.719	0.702	0.671	0.732	0.756	0.774	0.776
Venezuela	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other Central & South America	-0.032	-0.055	-0.083	-0.118	-0.132	-0.131	-0.128	-0.033
Europe	**-1.640**	**-2.856**	**-2.129**	**-2.524**	**-2.041**	**-2.039**	**-2.013**	**-1.983**
Austria	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Belgium	-0.103	-0.203	-0.095	-0.095	-0.094	-0.094	-0.094	-0.094
France	-0.442	-0.483	-0.388	-0.395	-0.387	-0.387	-0.385	-0.385
Germany	0.000	0.000	-0.062	-0.062	-0.062	-0.062	-0.062	-0.062
Italy	-0.086	-0.315	-0.123	-0.253	-0.123	-0.123	-0.122	-0.122
Netherlands	0.000	0.000	-0.145	-0.144	-0.144	-0.144	-0.144	-0.144
Norway	0.000	0.166	0.184	0.181	0.185	0.186	0.201	0.232
Poland	0.000	0.000	0.000	-0.144	0.000	0.000	0.000	0.000
Portugal	-0.054	-0.104	-0.119	-0.119	-0.119	-0.119	-0.118	-0.118
Romania	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Spain	-0.753	-0.955	-0.669	-0.668	-0.668	-0.667	-0.664	-0.664
Turkey	-0.168	-0.275	-0.099	-0.199	-0.015	-0.015	-0.015	-0.015
United Kingdom	-0.018	-0.647	-0.431	-0.430	-0.430	-0.430	-0.428	-0.428
Other Europe	-0.016	-0.041	-0.184	-0.197	-0.184	-0.183	-0.183	-0.183
Eurasia	**0.000**	**0.473**	**0.460**	**0.256**	**0.597**	**0.599**	**0.610**	**0.625**
Kazakhstan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Russia	0.000	0.473	0.460	0.466	0.597	0.599	0.610	0.625
Turkmenistan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ukraine	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Uzbekistan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other Eurasia	0.000	0.000	0.000	-0.210	0.000	0.000	0.000	0.000
Middle East	**1.534**	**3.450**	**4.549**	**4.587**	**4.891**	**5.021**	**5.199**	**5.265**
Iran	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Qatar	0.957	2.674	3.653	3.653	3.919	4.044	4.051	4.061
Oman	0.325	0.406	0.413	0.414	0.441	0.441	0.442	0.444
Saudi Arabia	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
United Arab Emirates	0.252	0.273	0.227	0.227	0.236	0.240	0.241	0.241
Other Middle East	0.000	0.097	0.257	0.294	0.295	0.296	0.464	0.519
Africa	**1.607**	**2.062**	**1.727**	**1.878**	**2.178**	**2.530**	**3.050**	**3.062**
Algeria	0.907	0.682	0.815	0.807	0.819	1.054	1.399	1.404
Egypt	0.245	0.343	0.000	0.000	0.000	0.000	0.000	0.000
Nigeria	0.425	0.844	0.727	0.677	0.915	0.921	1.002	1.007
Other Africa	0.031	0.194	0.185	0.394	0.443	0.555	0.649	0.651
Asia & Oceania	**-1.413**	**-2.957**	**-4.639**	**-6.285**	**-8.046**	**-9.992**	**-11.269**	**-11.503**
Australia	0.524	0.895	2.506	4.588	4.608	4.653	4.878	4.895
China	0.000	-0.444	-1.573	-4.894	-6.717	-8.661	-9.628	-9.848
India	-0.208	-0.421	-0.848	-0.990	-1.122	-1.584	-2.277	-2.431
Indonesia	1.111	1.107	0.897	1.283	1.293	1.440	1.854	2.115
Japan	-2.789	-3.426	-4.197	-4.445	-4.271	-4.080	-4.000	-3.730
Malaysia	1.007	1.078	1.087	1.258	1.394	1.507	1.508	1.512
Myanmar	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Pakistan	0.000	0.000	0.000	0.000	0.000	0.000	-0.356	-0.957
Singapore	0.000	0.000	-0.100	-0.100	-0.100	-0.099	-0.099	-0.099
South Korea	-1.049	-1.541	-2.246	-2.719	-2.896	-2.988	-2.974	-2.826
Thailand	0.000	0.000	-0.083	-0.083	-0.083	-0.083	-0.083	-0.083
Other Asia & Oceania	-0.008	-0.205	-0.083	-0.183	-0.153	-0.097	-0.092	-0.051
World	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**

LNG20_Hi-D12 Case (Net LNG Exports)(tcf)

	2005	2010	2015	2020	2025	2030	2035	2040
North America	**-0.551**	**-0.637**	**-0.404**	**1.962**	**2.125**	**3.724**	**3.962**	**3.974**
Canada	0.000	-0.072	-0.096	-0.089	-0.089	-0.088	-0.088	-0.088
Mexico	0.000	-0.198	-0.253	-0.253	-0.253	-0.252	-0.251	-0.251
United States	-0.551	-0.366	-0.054	2.304	2.467	4.065	4.301	4.313
Central & South America	**0.463**	**0.464**	**0.431**	**0.316**	**0.382**	**0.428**	**0.467**	**0.563**
Argentina	0.000	-0.062	-0.091	-0.091	-0.091	-0.091	-0.090	-0.090
Brazil	0.000	-0.096	-0.113	-0.113	-0.113	-0.113	-0.112	-0.112
Chile	0.000	-0.106	-0.162	-0.199	-0.199	-0.199	-0.198	-0.198
Colombia	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Peru	0.000	0.064	0.183	0.182	0.183	0.215	0.220	0.220
Trinidad and Tobago	0.495	0.719	0.698	0.655	0.732	0.746	0.774	0.776
Venezuela	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other Central & South America	-0.032	-0.055	-0.083	-0.117	-0.130	-0.132	-0.126	-0.033
Europe	**-1.640**	**-2.856**	**-2.128**	**-2.577**	**-2.041**	**-2.036**	**-2.013**	**-1.978**
Austria	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Belgium	-0.103	-0.203	-0.095	-0.095	-0.095	-0.094	-0.094	-0.094
France	-0.442	-0.483	-0.387	-0.409	-0.387	-0.386	-0.384	-0.384
Germany	0.000	0.000	-0.062	-0.062	-0.062	-0.062	-0.062	-0.062
Italy	-0.086	-0.315	-0.123	-0.274	-0.123	-0.123	-0.122	-0.122
Netherlands	0.000	0.000	-0.145	-0.144	-0.144	-0.144	-0.143	-0.143
Norway	0.000	0.166	0.184	0.181	0.185	0.186	0.197	0.232
Poland	0.000	0.000	0.000	-0.144	0.000	0.000	0.000	0.000
Portugal	-0.054	-0.104	-0.119	-0.119	-0.119	-0.119	-0.118	-0.118
Romania	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Spain	-0.753	-0.955	-0.668	-0.668	-0.667	-0.666	-0.663	-0.662
Turkey	-0.168	-0.275	-0.098	-0.207	-0.015	-0.015	-0.015	-0.015
United Kingdom	-0.018	-0.647	-0.430	-0.430	-0.430	-0.429	-0.427	-0.427
Other Europe	-0.016	-0.041	-0.184	-0.207	-0.184	-0.183	-0.182	-0.182
Eurasia	**0.000**	**0.473**	**0.456**	**0.248**	**0.597**	**0.599**	**0.610**	**0.622**
Kazakhstan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Russia	0.000	0.473	0.456	0.458	0.597	0.599	0.610	0.622
Turkmenistan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ukraine	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Uzbekistan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other Eurasia	0.000	0.000	0.000	-0.210	0.000	0.000	0.000	0.000
Middle East	**1.534**	**3.450**	**4.549**	**4.586**	**4.887**	**5.021**	**5.203**	**5.265**
Iran	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Qatar	0.957	2.674	3.653	3.652	3.915	4.043	4.051	4.061
Oman	0.325	0.406	0.413	0.414	0.441	0.441	0.443	0.444
Saudi Arabia	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
United Arab Emirates	0.252	0.273	0.227	0.227	0.237	0.240	0.241	0.241
Other Middle East	0.000	0.097	0.257	0.294	0.295	0.296	0.468	0.519
Africa	**1.607**	**2.062**	**1.727**	**1.834**	**2.178**	**2.459**	**3.048**	**3.058**
Algeria	0.907	0.682	0.815	0.773	0.819	1.009	1.399	1.404
Egypt	0.245	0.343	0.000	0.000	0.000	0.000	0.000	0.000
Nigeria	0.425	0.844	0.727	0.668	0.916	0.920	1.002	1.007
Other Africa	0.031	0.194	0.185	0.393	0.443	0.529	0.647	0.647
Asia & Oceania	**-1.413**	**-2.957**	**-4.633**	**-6.369**	**-8.129**	**-10.194**	**-11.276**	**-11.504**
Australia	0.524	0.895	2.506	4.561	4.608	4.644	4.878	4.894
China	0.000	-0.444	-1.567	-4.929	-6.773	-8.773	-9.608	-9.824
India	-0.208	-0.421	-0.845	-0.991	-1.124	-1.625	-2.276	-2.425
Indonesia	1.111	1.107	0.892	1.283	1.293	1.419	1.823	2.076
Japan	-2.789	-3.426	-4.195	-4.456	-4.272	-4.091	-3.991	-3.723
Malaysia	1.007	1.078	1.087	1.258	1.381	1.506	1.508	1.512
Myanmar	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Pakistan	0.000	0.000	0.000	0.000	0.000	0.000	-0.362	-0.962
Singapore	0.000	0.000	-0.100	-0.100	-0.100	-0.099	-0.099	-0.099
South Korea	-1.049	-1.541	-2.245	-2.727	-2.898	-2.989	-2.969	-2.821
Thailand	0.000	0.000	-0.083	-0.083	-0.083	-0.083	-0.082	-0.082
Other Asia & Oceania	-0.008	-0.205	-0.083	-0.186	-0.162	-0.102	-0.097	-0.051
World	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**

LNG20_Ref20 Case (Net LNG Exports)(tcf)

	2005	2010	2015	2020	2025	2030	2035	2040
North America	**-0.551**	**-0.637**	**-0.404**	**1.977**	**2.188**	**4.475**	**6.364**	**6.530**
Canada	0.000	-0.072	-0.096	-0.089	-0.089	-0.089	-0.089	-0.089
Mexico	0.000	-0.198	-0.253	-0.253	-0.253	-0.253	-0.253	-0.252
United States	-0.551	-0.366	-0.054	2.319	2.529	4.816	6.706	6.871
Central & South America	**0.463**	**0.464**	**0.435**	**0.318**	**0.380**	**0.404**	**0.451**	**0.494**
Argentina	0.000	-0.062	-0.091	-0.091	-0.091	-0.091	-0.091	-0.091
Brazil	0.000	-0.096	-0.113	-0.113	-0.113	-0.113	-0.113	-0.113
Chile	0.000	-0.106	-0.162	-0.199	-0.199	-0.199	-0.199	-0.199
Colombia	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Peru	0.000	0.064	0.183	0.182	0.183	0.206	0.220	0.220
Trinidad and Tobago	0.495	0.719	0.704	0.658	0.732	0.733	0.772	0.774
Venezuela	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other Central & South America	-0.032	-0.055	-0.085	-0.119	-0.132	-0.133	-0.138	-0.097
Europe	**-1.640**	**-2.856**	**-2.122**	**-2.584**	**-2.041**	**-2.039**	**-2.039**	**-2.036**
Austria	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Belgium	-0.103	-0.203	-0.095	-0.095	-0.095	-0.094	-0.094	-0.094
France	-0.442	-0.483	-0.388	-0.408	-0.387	-0.387	-0.387	-0.387
Germany	0.000	0.000	-0.062	-0.062	-0.062	-0.062	-0.062	-0.062
Italy	-0.086	-0.315	-0.123	-0.278	-0.123	-0.123	-0.123	-0.123
Netherlands	0.000	0.000	-0.145	-0.144	-0.144	-0.144	-0.144	-0.144
Norway	0.000	0.166	0.184	0.181	0.185	0.186	0.186	0.187
Poland	0.000	0.000	0.000	-0.144	0.000	0.000	0.000	0.000
Portugal	-0.054	-0.104	-0.119	-0.119	-0.119	-0.119	-0.119	-0.119
Romania	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Spain	-0.753	-0.955	-0.668	-0.668	-0.668	-0.667	-0.667	-0.667
Turkey	-0.168	-0.275	-0.092	-0.209	-0.015	-0.015	-0.015	-0.015
United Kingdom	-0.018	-0.647	-0.431	-0.430	-0.430	-0.430	-0.430	-0.429
Other Europe	-0.016	-0.041	-0.184	-0.208	-0.184	-0.184	-0.184	-0.183
Eurasia	**0.000**	**0.473**	**0.460**	**0.250**	**0.597**	**0.598**	**0.600**	**0.620**
Kazakhstan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Russia	0.000	0.473	0.460	0.460	0.597	0.598	0.600	0.620
Turkmenistan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ukraine	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Uzbekistan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other Eurasia	0.000	0.000	0.000	-0.210	0.000	0.000	0.000	0.000
Middle East	**1.534**	**3.450**	**4.549**	**4.586**	**4.878**	**5.020**	**5.063**	**5.256**
Iran	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Qatar	0.957	2.674	3.653	3.652	3.907	4.042	4.047	4.055
Oman	0.325	0.406	0.413	0.414	0.441	0.441	0.442	0.443
Saudi Arabia	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
United Arab Emirates	0.252	0.273	0.227	0.227	0.235	0.240	0.240	0.241
Other Middle East	0.000	0.097	0.257	0.294	0.295	0.296	0.334	0.517
Africa	**1.607**	**2.062**	**1.714**	**1.788**	**2.178**	**2.319**	**2.929**	**3.051**
Algeria	0.907	0.682	0.815	0.766	0.819	0.914	1.359	1.400
Egypt	0.245	0.343	0.000	0.000	0.000	0.000	0.000	0.000
Nigeria	0.425	0.844	0.714	0.631	0.916	0.920	0.938	1.004
Other Africa	0.031	0.194	0.185	0.391	0.443	0.485	0.632	0.647
Asia & Oceania	**-1.413**	**-2.957**	**-4.632**	**-6.334**	**-8.180**	**-10.775**	**-13.368**	**-13.916**
Australia	0.524	0.895	2.506	4.565	4.608	4.629	4.828	4.885
China	0.000	-0.444	-1.568	-4.896	-6.791	-9.178	-10.843	-11.268
India	-0.208	-0.421	-0.845	-0.991	-1.127	-1.699	-2.535	-2.994
Indonesia	1.111	1.107	0.893	1.283	1.293	1.372	1.555	2.029
Japan	-2.789	-3.426	-4.194	-4.457	-4.277	-4.117	-4.069	-3.804
Malaysia	1.007	1.078	1.087	1.258	1.368	1.506	1.506	1.508
Myanmar	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Pakistan	0.000	0.000	0.000	0.000	0.000	0.000	-0.502	-1.124
Singapore	0.000	0.000	-0.100	-0.100	-0.100	-0.100	-0.099	-0.099
South Korea	-1.049	-1.541	-2.245	-2.728	-2.901	-3.003	-3.024	-2.889
Thailand	0.000	0.000	-0.083	-0.083	-0.083	-0.083	-0.083	-0.083
Other Asia & Oceania	-0.008	-0.205	-0.084	-0.185	-0.172	-0.102	-0.102	-0.077
World	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**

LNG20_HRR20 Case (Net LNG Exports)(tcf)

	2005	2010	2015	2020	2025	2030	2035	2040
North America	**-0.551**	**-0.637**	**-0.404**	**1.980**	**2.398**	**5.086**	**6.772**	**6.865**
Canada	0.000	-0.072	-0.096	-0.089	-0.089	-0.089	-0.089	-0.089
Mexico	0.000	-0.198	-0.253	-0.253	-0.253	-0.253	-0.253	-0.253
United States	-0.551	-0.366	-0.054	2.322	2.739	5.427	7.113	7.206
Central & South America	**0.463**	**0.464**	**0.435**	**0.314**	**0.378**	**0.383**	**0.446**	**0.498**
Argentina	0.000	-0.062	-0.091	-0.091	-0.091	-0.091	-0.091	-0.091
Brazil	0.000	-0.096	-0.113	-0.113	-0.113	-0.113	-0.113	-0.113
Chile	0.000	-0.106	-0.162	-0.199	-0.199	-0.199	-0.199	-0.199
Colombia	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Peru	0.000	0.064	0.183	0.182	0.183	0.192	0.220	0.220
Trinidad and Tobago	0.495	0.719	0.702	0.657	0.732	0.733	0.772	0.774
Venezuela	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other Central & South America	-0.032	-0.055	-0.084	-0.121	-0.134	-0.139	-0.143	-0.093
Europe	**-1.640**	**-2.856**	**-2.127**	**-2.599**	**-2.041**	**-2.040**	**-2.038**	**-2.038**
Austria	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Belgium	-0.103	-0.203	-0.095	-0.095	-0.094	-0.094	-0.094	-0.094
France	-0.442	-0.483	-0.388	-0.410	-0.387	-0.387	-0.387	-0.387
Germany	0.000	0.000	-0.062	-0.062	-0.062	-0.062	-0.062	-0.062
Italy	-0.086	-0.315	-0.123	-0.288	-0.123	-0.123	-0.123	-0.123
Netherlands	0.000	0.000	-0.145	-0.144	-0.144	-0.144	-0.144	-0.144
Norway	0.000	0.166	0.184	0.181	0.185	0.186	0.186	0.187
Poland	0.000	0.000	0.000	-0.144	0.000	0.000	0.000	0.000
Portugal	-0.054	-0.104	-0.119	-0.119	-0.119	-0.119	-0.119	-0.119
Romania	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Spain	-0.753	-0.955	-0.668	-0.668	-0.667	-0.667	-0.667	-0.667
Turkey	-0.168	-0.275	-0.097	-0.211	-0.015	-0.015	-0.015	-0.015
United Kingdom	-0.018	-0.647	-0.431	-0.430	-0.430	-0.430	-0.430	-0.430
Other Europe	-0.016	-0.041	-0.184	-0.208	-0.184	-0.184	-0.183	-0.183
Eurasia	**0.000**	**0.473**	**0.460**	**0.250**	**0.597**	**0.598**	**0.599**	**0.619**
Kazakhstan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Russia	0.000	0.473	0.460	0.460	0.597	0.598	0.599	0.619
Turkmenistan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ukraine	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Uzbekistan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other Eurasia	0.000	0.000	0.000	-0.210	0.000	0.000	0.000	0.000
Middle East	**1.534**	**3.450**	**4.549**	**4.586**	**4.863**	**5.018**	**5.053**	**5.255**
Iran	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Qatar	0.957	2.674	3.653	3.652	3.894	4.041	4.047	4.054
Oman	0.325	0.406	0.413	0.414	0.441	0.441	0.442	0.443
Saudi Arabia	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
United Arab Emirates	0.252	0.273	0.227	0.227	0.233	0.240	0.240	0.241
Other Middle East	0.000	0.097	0.257	0.294	0.295	0.296	0.325	0.517
Africa	**1.607**	**2.062**	**1.709**	**1.786**	**2.177**	**2.217**	**2.853**	**3.057**
Algeria	0.907	0.682	0.815	0.772	0.819	0.845	1.304	1.400
Egypt	0.245	0.343	0.000	0.000	0.000	0.000	0.000	0.000
Nigeria	0.425	0.844	0.709	0.624	0.915	0.919	0.933	1.004
Other Africa	0.031	0.194	0.185	0.390	0.443	0.453	0.616	0.653
Asia & Oceania	**-1.413**	**-2.957**	**-4.621**	**-6.318**	**-8.372**	**-11.263**	**-13.686**	**-14.256**
Australia	0.524	0.895	2.506	4.560	4.607	4.615	4.810	4.884
China	0.000	-0.444	-1.561	-4.877	-6.904	-9.473	-11.053	-11.356
India	-0.208	-0.421	-0.843	-0.992	-1.134	-1.783	-2.564	-3.182
Indonesia	1.111	1.107	0.893	1.284	1.294	1.318	1.532	2.005
Japan	-2.789	-3.426	-4.193	-4.456	-4.282	-4.146	-4.072	-3.812
Malaysia	1.007	1.078	1.087	1.258	1.335	1.505	1.506	1.508
Myanmar	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Pakistan	0.000	0.000	0.000	0.000	0.000	0.000	-0.526	-1.139
Singapore	0.000	0.000	-0.100	-0.100	-0.100	-0.099	-0.100	-0.099
South Korea	-1.049	-1.541	-2.244	-2.727	-2.905	-3.013	-3.027	-2.896
Thailand	0.000	0.000	-0.083	-0.083	-0.083	-0.083	-0.083	-0.083
Other Asia & Oceania	-0.008	-0.205	-0.083	-0.186	-0.200	-0.104	-0.109	-0.084
World	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**

U.S. DEPARTMENT OF ENERGY | National Energy Technology Laboratory

OFFICE OF FOSSIL ENERGY

Life Cycle Greenhouse Gas Perspective on Exporting Liquefied Natural Gas from the United States

May 29, 2014

DOE/NETL-2014/1649

Disclaimer

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This report was prepared by Energy Sector Planning and Analysis (ESPA) for the United States Department of Energy (DOE), National Energy Technology Laboratory (NETL). This work was completed under DOE NETL Contract Number DE-FE0004001. This work was performed under ESPA Task 150.08.02.

The authors wish to acknowledge the excellent guidance, contributions, and cooperation of the NETL staff.

DOE Contract Number DE-FE0004001

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Acronyms and Abbreviations

AR4	Fourth Assessment Report (IPCC)
AR5	Fifth Assessment Report (IPCC)
AU	Australia
Btu	British thermal unit
CH_4	Methane
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
DZ	Algeria
ECF	Energy conversion facility
EIA	Energy Information Administration
EU	End use
GHG	Greenhouse gas
GWP	Global warming potential
HRSG	Heat recovery steam generator
I-6	Illinois No. 6
IPCC	Intergovernmental Panel on Climate Change
JP	Japan
kg	Kilogram
km	Kilometer
lb	Pound
LCA	Life cycle analysis
LNG	Liquefied natural gas
mi	Mile
MWe	Megawatt electric
MWh	Megawatt-hour
N_2O	Nitrous Oxide
NL	Netherlands
Nmi	Nautical mile
NETL	National Energy Technology Laboratory
NGCC	Natural gas combined cycle
NSPS	New Source Performance Standards
PRB	Powder River Basin
PT	Product Transport
RMA	Raw material acquisition
RMT	Raw material transport
RU	Russia
SF_6	Sulfur hexafluoride
scf	Standard cubic foot
SCPC	Supercritical pulverized coal
U.S.	United States

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1 Introduction

This analysis calculates the life cycle greenhouse gas (GHG) emissions for regional coal and imported natural gas power in Europe and Asia. The primary research questions are as follows:

- How does exported liquefied natural gas (LNG) from the U.S. compare with regional coal (or other LNG sources) for electric power generation in Europe and Asia, from a life cycle greenhouse gas (GHG) perspective?
- How do those results compare with natural gas sourced from Russia and delivered to the same European and Asian markets via pipeline?

The National Energy Technology Laboratory (NETL) exercised its life cycle analysis (LCA) model to represent unconventional natural gas production and transport to a New Orleans liquefaction facility, liquefaction, and then transport to an import terminal in Rotterdam, Netherlands to represent a European market and to Shanghai, China to represent Asian Markets. LNG from Oran, Algeria was modeled to represent an alternative regional LNG European market supply source with a destination of Rotterdam and LNG from Darwin, Australia was modeled to represent an alternative regional LNG Asian market supply source with a destination of Osaka, Japan. Conventional natural gas extracted from the Yamal region of Siberia in Russia was modeled as the regional pipeline gas alternative for both the European and Asian markets. Regional coal production and consumption (i.e., Germany and China) were also modeled. Scenario specific variability was modeled by adjusting methane leakage for natural gas production, coal type (bituminous and sub-bituminous), transport distance (ocean tanker for LNG and rail for coal), and power plant efficiency.

This analysis is based on data that were originally developed to represent U.S. energy systems. In general, the NETL natural gas and coal LCA models were adapted for this study. U.S. natural gas production and average U.S. coal production were modeled as representative of foreign natural gas and coal production. No ocean transport of coal was included to represent the most conservative coal profile (regionally sourced or imported). The specific LNG export/import locations used in this study were chosen to represent an estimate for a region (e.g. New Orleans as U.S. Gulf Coast). Specific locations were required to allow for the estimation of LNG transport distances and do not imply the likelihood that LNG export or import will occur from that exact location. The same assumptions hold true for the Russian natural gas cases.

2 LCA Approach

This is a cradle-to-grave LCA that begins with extraction of natural gas or coal and ends with electricity delivered to the consumer. NETL uses five life cycle (LC) stages, beginning with the acquisition of raw materials and ending with energy consumption. These five life cycle stages are listed below:

- **LC Stage #1:** Raw Material Acquisition (RMA) includes extraction of a natural resource and any necessary processing steps that prepare it for transport. The raw materials of this analysis are natural gas and coal.
- **LC Stage #2:** Raw Material Transport (RMT) includes the transport of a raw material between the extraction site and power plant. Natural gas is transported by pipeline and ocean tanker for the LNG cases and pipeline only for the Russian natural gas cases; coal is transported by rail.
- **LC Stage #3:** Energy Conversion Facility (ECF) includes the operation of a power plant that converts fuel to energy. The power plants of this analysis convert natural gas or coal to

electricity. The handling and disposal of coal waste products are outside of the boundary of this analysis and are assumed to have minimal GHG emissions relative to the other processes considered in this analysis.

- **LC Stage #4:** Product Transport (PT) moves the product from the ECF to the consumer. In this analysis, electricity is transported over a national electricity grid.
- **LC Stage #5:** End Use (EU) represents the final consumption of a product. In this analysis, no burdens are associated with the consumption of electricity.

Four scenarios are modeled in this analysis for two different geographies (Europe and Asia)[1]:

- **Scenario 1:** Natural gas is extracted in the U.S. from the Marcellus Shale, transported by pipeline to an LNG facility where it is compressed and loaded onto an LNG tanker, transported to an LNG port in the receiving country (Rotterdam for the European case and Shanghai for the Asian case) where it is re-gasified, and then transported to a natural gas power plant. It was assumed that the power plant is located near the LNG import site.
- **Scenario 2:** This is the same as Scenario 1, except that the natural gas comes from a regional source relative to the destination. In the European case, the source is Algeria, and in the Asian case, the source is Australia. It was assumed that the regional gas is produced using conventional extraction methods. The LNG tanker transport distance is adjusted accordingly.
- **Scenario 3:** Natural gas is produced in the Siberian region of Russia utilizing conventional extraction methods and is transported by pipeline to a power plant in Europe or Asia.
- **Scenario 4:** Coal is extracted in the region of study (Europe or Asia) and transported by rail to a domestic coal-fired power plant in China or Germany. This analysis models both surface sub-bituminous and underground bituminous coals based on U.S. extraction data.

In all four scenarios, electricity is distributed using existing transmission infrastructure. The functional unit, which serves as a basis for comparison, is 1 MWh of electricity delivered to a consumer. The results of this analysis include only GHG emissions. GHGs in this inventory are reported on a common mass basis of carbon dioxide equivalents (CO_2e) using the global warming potentials (GWP) of each gas from the 2013 Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5) (IPCC, 2013). The default GWP used is the 100-year time frame but, in some cases, results for the 20-year time frame are presented as well. **Table 2-1** shows the GWPs used for the GHGs inventoried in this study. The Appendix also provides results on the basis of the GWPs developed in the Fourth Assessment Report (AR4) in the Appendix (Forster, et al., 2007). Note that the AR5 GWP value used for fossil methane emissions was 30. There are no biogenic methane releases in the natural gas or coal models. The AR5 GWP for biogenic methane is 28.

[1] The goal of this analysis is to model plausible (medium and long distance) export scenarios while also considering regional fuel alternatives. The purpose of the medium and long distance scenarios is to establish low and high bounds for likely results.

Table 2-1: IPCC AR4 and AR5 Global Warming Potentials (Forster, et al., 2007 and IPCC, 2013)

GHG	AR5 (IPCC 2013)		AR4 (IPCC 2007)	
	20-year	100-year (Default)	20-year	100-year
CO_2	1	1	1	1
CH_4	85	30	72	25
N_2O	264	265	289	298
SF_6	17,500	23,500	16,300	22,800

3 Natural Gas Modeling Approach

NETL's natural gas model uses a comprehensive set of parameters within a flexible network of unit processes, allowing the modeling of different types of natural gas sources. Key variables include lifetime well production rates, emission factors for episodic emissions (e.g. completions and workovers), flaring rates at extraction and processing, workover and liquid unloading frequency, and pipeline distance. The model currently has scenarios for natural gas from the following seven sources: conventional onshore, associated, conventional offshore, tight gas, Barnett Shale, Marcellus Shale, and coal bed methane. For additional details on the natural gas model, refer to the NETL Life Cycle Analysis of Natural Gas Extraction and Power Generation (NETL, 2014). For Scenario 1 of this analysis, all natural gas is modeled as unconventional gas from the Marcellus Shale. For the purposes of this analysis, Marcellus Shale gas was utilized as a proxy for new unconventional natural gas production. The life cycle GHG emissions for the extraction of natural gas from Barnett Shale, Marcellus Shale, and tight gas as modeled in the NETL Life Cycle Analysis of Natural Gas Extraction and Power Generation differed by less than 2 percent (NETL, 2014). For Scenarios 2 and 3, the extraction process is modeled after conventional onshore natural gas production in the U.S. This includes both the regional LNG supply options (Algeria for Europe and Australia for Asia) and extraction in Siberia for pipeline transport to the demand centers.

In all three natural gas scenarios, the extracted and processed natural gas is transported via pipeline, either to an LNG terminal (Scenarios 1 and 2) or directly to a power plant (Scenario 3). The transmission of natural gas by pipeline involves the combustion of a portion of the natural gas in compressors as well as fugitive losses of natural gas. For Scenarios 1 and 2, the pipeline distance from natural gas extraction site to the LNG terminal is 971 km. This is the average distance of natural gas pipeline transmission in the U.S. (NETL, 2014). This distance is based on the characteristics of the entire transmission network and delivery rate for natural gas in the U.S. Note, the same pipeline distance is utilized for both the U.S. and regional LNG scenarios. This simplification was utilized to focus on the differences in life cycle GHG emissions from transport of the LNG.

NETL's model also includes an option for the LNG supply chain. After extraction and processing, natural gas is transported by pipeline to a liquefaction facility. The LNG is then loaded onto an ocean tanker, transported to an LNG terminal with regasification operations, and then fed to a pipeline that transports it to a power plant. The data for the LNG supply chain accounts for the construction and operation of LNG infrastructure. For this analysis, it was assumed that the natural gas power plant in each of the import destinations is existing and located close to the LNG port, so no additional pipeline transport of natural gas is modeled in the destination country.

For the U.S. (New Orleans) to Shanghai, China route, it was assumed that the Panama Canal is a viable option for LNG tankers. This assumption is tested in the uncertainty analysis section of this study. All other routes (New Orleans to Rotterdam, Netherlands; Oran, Algeria to Rotterdam, Netherlands; and Darwin, Australia to Osaka, Japan) do not require the use of a canal. The distances used for LNG transport are available in **Table 5-1**.

For Scenario 3, the pipeline distance was calculated based on the great circle distance between the Yamal district of Siberia, Russia to a power plant located in Rotterdam, Netherlands or Shanghai, China. Yamal was chosen as the extraction site because that region accounted for 82.6 percent of Russian natural gas production in 2012 (EIA, 2013). The great circle distance is the shortest possible distance between two points on a sphere and was therefore used to represent the shortest possible pipeline distance between the extraction source and the power plant. An additional 1,000 km of pipeline transport were added to the great circle distance to specify the expected pipeline transport distance. Given the extensive pipeline networks in Europe and Asia, determining an actual distance was not possible, nor was it required for this level of analysis. This assumption is tested in the uncertainty analysis section of this study. The distances used for pipeline transport of Russian gas are available in **Table 5-2**.

The efficiency of the destination power plant is an important parameter required for determining the life cycle emissions for natural gas power. Average baseload natural gas-fired power plants in the U.S. have a net efficiency of 46.4 percent (NETL, 2014). This analysis utilized the range of efficiencies that are consistent with the NETL modeling of natural gas power in the U.S. (NETL, 2014). This analysis assumed the same range of power plant efficiencies in the destination countries as was used for the U.S. model. The efficiency range is designed to be representative of fleet baseload power plants.

The transmission of electricity from the power plant to consumer incurs a 7 percent loss of electricity. The consumption of electricity does not have any energy or material flows. A comprehensive list of the modeling parameters and values for the natural gas scenarios are provided in **Table 5-1** and **Table 5-2**.

4 Coal Modeling Approach

This analysis utilizes NETL's existing LCA model for the extraction and transport of sub-bituminous and bituminous coal in the U.S. for foreign extraction in Germany and China. Foreign coal production was modeled as having emissions characteristics equivalent to average U.S. coal production.

Raw material extraction for coal incorporates extraction profiles for coal derived from the Powder River Basin (PRB), where sub-bituminous, low-rank coal is extracted from thick coal seams (up to approximately 180 feet) via surface mines located in Montana and Wyoming, and coal derived from the Illinois No. 6 (I-6) coal seam, where bituminous coal is extracted via underground longwall and continuous mining. In general, PRB represents coal from surface mining sources, and I-6 coal represents coal from underground sources. The regionally extracted coal is transported to the power plant by rail in both the European and Asian cases. The expected rail distance for both locations is 725 miles.

PRB coal is modeled using modern mining methods in practice at the following mines: Peabody Energy's North Antelope-Rochelle mine (97.5 million short tons produced in 2008), Arch Coal, Inc.'s Black Thunder Mine (88.5 million short tons produced in 2008), Rio Tinto Energy America's Jacobs Ranch (42.1 million short tons produced in 2008), and Cordero Rojo Operation (40.0 million short tons produced in 2008). These four mines were the largest surface mines in the United States in 2008 according to the National Mining Association's 2008 Coal Producer Survey (National Mining Association, 2009). For the purposes of this assessment, it is assumed that the coal seam in the area of active mining was previously drilled to extract methane. Based on the NETL Quality Guidelines for Energy Systems Studies, this analysis uses a factor of 8 scf/ton for coal bed methane emissions for surface mining of PRB coal and a heating value of 8,564 Btu/lb (NETL, 2010a; 2012).

I-6 coal is part of the Herrin Coal seam, and is a bituminous coal that is found in seams in the southern and eastern regions of Illinois and surrounding areas that typically range from about 2 to 15 feet in thickness. I-6 coal is commonly extracted via underground mining techniques, including continuous and longwall mining. I-6 coal seams may contain relatively high levels of mineral sediments or other materials, and therefore require coal cleaning (beneficiation) at the mine site. During the acquisition of I-6 coal, methane is released during both the underground coal extraction and the post-mining coal preparation activities. Based on the NETL Quality Guidelines for Energy Systems Studies, this analysis uses a factor of 360 scf/ton for coal bed methane emissions for underground mining of I-6 coal and a heating value of 11,666 Btu/lb (NETL, 2010b; 2012).

The heating value of coal and the heat rate of the power plant were used to determine the feed rate of coal to the power plant. Average baseload coal-fired power plants in the U.S. have a net efficiency of 33.0 percent (NETL, 2014). For consistency, this analysis utilized the range of efficiencies that were previously used for the modeling of coal power in the U.S. (NETL, 2014). This analysis assumed the same range of power plant efficiencies for Europe and Asia as the U.S. model. The efficiency range is designed to be representative of fleet baseload power plants.

Electricity transmission and consumption is modeled using the same data used by the natural gas power scenario. The transmission of electricity from the power plant to consumer incurs a 7 percent loss of electricity. The consumption of electricity does not have any energy or material flows. A comprehensive list of the modeling parameters and values for the coal scenarios are provided in **Table 5-3**.

5 Key Modeling Parameters

The LCA results are sensitive to changes in natural gas and coal and extraction characteristics, transport distances, and power plant performance. The key parameters for the natural gas scenarios are shown in **Table 5-1** (LNG) and **Table 5-2** (Russian natural gas), and the key parameters for the coal scenario are shown in **Table 5-3**. The range of natural gas methane leakage rates is calculated as a function of more specific parameters used in that model, such as the flaring rate, well completion, and well workover factors. The range in leakage rate is a function of the uncertainty of the underlying parameters. These parameter values and ranges are detailed in **Tables 5-4, 5-5,** and **5-6**, as well as the the NETL Life Cycle Analysis of Natural Gas Extraction and Power Generation (NETL, 2014).

The methane leakage for the Russian natural gas cases is higher than the leakage for LNG because of the difference in the pipeline distance. There are also slight differences in methane leakage from extraction between the difference gas types, but the majority of the difference is driven by pipeline losses. A methane leakage breakeven analysis is conducted in **Section 6** of this document. That analysis determines the breakeven leakage at which the life cycle GHG emissions for natural gas power would equal those for the coal reference case. NETL's upstream results are consistent with other life cycle studies on natural gas. For a more detailed review of the status of current natural gas research, related uncertainties, and a comparison of the NETL life cycle GHG results with those from literature, see **Section 6** of the NETL Life Cycle Analysis of Natural Gas Extraction and Power Generation (NETL, 2014).

Table 5-1: Key Modeling Parameters for Natural Gas Extraction, Export, and Power Generation – LNG Cases

LC Stage	Model Parameter		Low	Expected	High
LC Stage #1 (RMA) and #2 (RMT)	Methane Leakage (cradle-to-liquefaction)	Marcellus Shale Gas	1.2%	1.4%	1.6%
		Conventional Onshore Gas	1.1%	1.3%	1.6%
	Gas Type		Marcellus Shale – U.S. Gas Conventional Onshore – Regional Gas		
	Pipeline Distance (Extraction to LNG Facility) (km)		777	971	1,166
	Transport Distances (Nautical mi)	New Orleans to Rotterdam, Netherlands	4,301	4,801	5,301
		Oran, Algeria to Rotterdam, Netherlands	1,082	1,582	2,082
		New Orleans to Shanghai, China	9,497	9,997	14,844
		Darwin, Australia to Osaka, Japan	2,385	2,885	3,385
LC Stage #3 (ECF)	Power Plant Net Efficiency		41.2%	46.4%	49.2%
LC Stage #4 (PT)	Electricity Transmission and Distribution Loss		7%		

Table 5-2: Key Modeling Parameters for Natural Gas Extraction, Export, and Power Generation – Russian Cases

LC Stage	Model Parameter		Low	Expected	High
LC Stage #1 (RMA) and #2 (RMT)	Methane Leakage[1] (cradle-to-delivered)	Yamal, Russia to Rotterdam, Netherlands	2.8%	3.4%	4.1%
		Yamal, Russia to Shanghai, China	3.7%	4.3%	5.0%
	Gas Type		Conventional Onshore		
	Pipeline Distance (km)	Yamal, Russia to Rotterdam, Netherlands	3,792	4,792	5,792
		Yamal, Russia to Shanghai, China	5,447	6,447	7,447
LC Stage #3 (ECF)	Power Plant Net Efficiency		41.2%	46.4%	49.2%
LC Stage #4 (PT)	Electricity Transmission and Distribution Loss		7%		

Table 5-3: Key Modeling Parameters for Coal Extraction and Power Generation

LC Stage	Model Parameter	Low	Expected	High
LC Stage #1 (RMA)	Coal Mine Methane (scf/ton)	8	8	360
	Coal Type	PRB	PRB	I-6
LC Stage #2 (RMT)	Rail Transport Distance (miles)	225	725	1,225
LC Stage #3 (ECF)	Power Plant Net Efficiency	28.3%	33.0%	36.7%
LC Stage #4 (PT)	Electricity Transmission and Distribution Loss	7%		

[1] U.S. conventional onshore extraction is used as a proxy for Russian natural gas extraction in the model for this analysis. The differences in the calculated leakage rates for Russian natural gas (as compared to the U.S. leakage rates in Table 5-1) are driven only by the longer pipeline transmission distance for the extracted gas. As the pipeline distance increases, the total methane leakage from pipeline transmission increases and so does the amount of natural gas that is extracted to meet the same demand for delivered natural gas.

Table 5-4 summarizes the key extraction parameters for each extraction type. The average production rate of each well is used to apportion episodic emissions per unit of gas produced. Episodic emissions occur as one-time impulses or, in some cases, as periodic well maintenance activities. Examples of episodic emissions include the volume of natural gas vented during well completions and workovers (which are higher for unconventional wells than for conventional wells) and liquid unloading (a practice assumed to be unique to onshore conventional wells). Flaring rate is a modeling parameter because the global warming potential of vented natural gas, which is composed mostly of methane, can be reduced if it is flared to CO_2. Emissions from valves and other sources are key sources of emissions that occur during steady-state extraction operations. **Table 5-4** also shows uncertainty bounds when such data are available. The two uncertainties that the model accounts for during natural gas extraction are well production rates and flaring rates.

Table 5-4: Parameters for Natural Gas Extraction

Property (Units)		Onshore Conventional	Marcellus Shale
Natural Gas Source			
Average Production Rate (Mcf/day)	L	46	201
	E	66	297
	H	86	450
Expected EUR (Bcf)		0.72	3.25
Natural Gas Extraction			
Flaring Rate of Vented NG (%)		51% (41 - 61%)	15% (12 - 18%)
Well Completion (Mcf natural gas/episode)		37	9,000
Well Workover (Mcf natural gas/episode)		2.44	9,000
Lifetime Well Workovers (Episodes/well)		1.1	0.3
Liquids Unloading (Mcf/episode)		3.57	N/A
Lifetime Liquid Unloadings (Episodes/well)		930	N/A
Valve Emissions, Fugitive (lb. CH_4/Mcf)		0.11	
Other Sources, Point Source (lb. CH_4/Mcf)		0.003	
Other Sources, Fugitive (lb. CH_4/Mcf)		0.043	

Table 5-5 shows the modeling parameters for natural gas processing. It accounts for the removal efficiencies and emissions from acid gas removal and dehydration, emissions from valves and other processing infrastructure, and the type of compressors used at processing facilities. All natural gas processing plants are assumed to have the same performance characteristics, regardless of natural gas source. The one exception is compressor profiles; most onshore processing plants use gas-powered reciprocating compressors, all offshore processing plants use gas-powered centrifugal compressors, and processing plants in the Barnett Shale region uses a combination of gas-powered reciprocating and electrically-powered centrifugal compressors.

Table 5-5: Parameters for Natural Gas Processing

Property (Units)	Onshore Conventional	Marcellus Shale
Acid Gas Removal (Amine Absorber and Regenerator)		
Flaring Rate of Vented NG (%)	100%	
CH_4 Absorbed (lb. CH_4/Mcf)	0.04	
CO_2 Absorbed (lb. CO_2/Mcf)	0.56	
H_2S Absorbed (lb. H_2S/Mcf)	0.21	
NMVOC Absorbed (lb. NMVOC/Mcf)	6.59	
Dehydration (Glycol Dehydrator and Regenerator)		
Flaring Rate of Vented NG (%)	100%	
Water Removed (lb. H_2O/Mcf)	0.045	
CH_4 Emission Rate (lb. CH_4/Mcf)	0.0003	
Valves & Other Sources of Emissions		
Flaring Rate (%)	100%	
Valve Emissions, Fugitive (lb. CH_4/Mcf)	0.0003	
Other Sources, Point Source (lb. CH_4/Mcf)	0.02	
Other Sources, Fugitive (lb. CH_4/Mcf)	0.03	
Natural Gas Compressor Profile at Processing Plant		
Gas-powered Reciprocating (%)	100%	100%
Gas-powered Centrifugal (%)	0%	0%
Electrically-powered Centrifugal (%)	0%	0%

Table 5-6 shows the modeling parameters for natural gas transmission by pipeline. An average transmission distance of 971 km (604 miles) with an uncertainty of +/- 20 percent is used for all natural gas types. The mix of compressor technologies used for natural gas transmission is also parameterized.

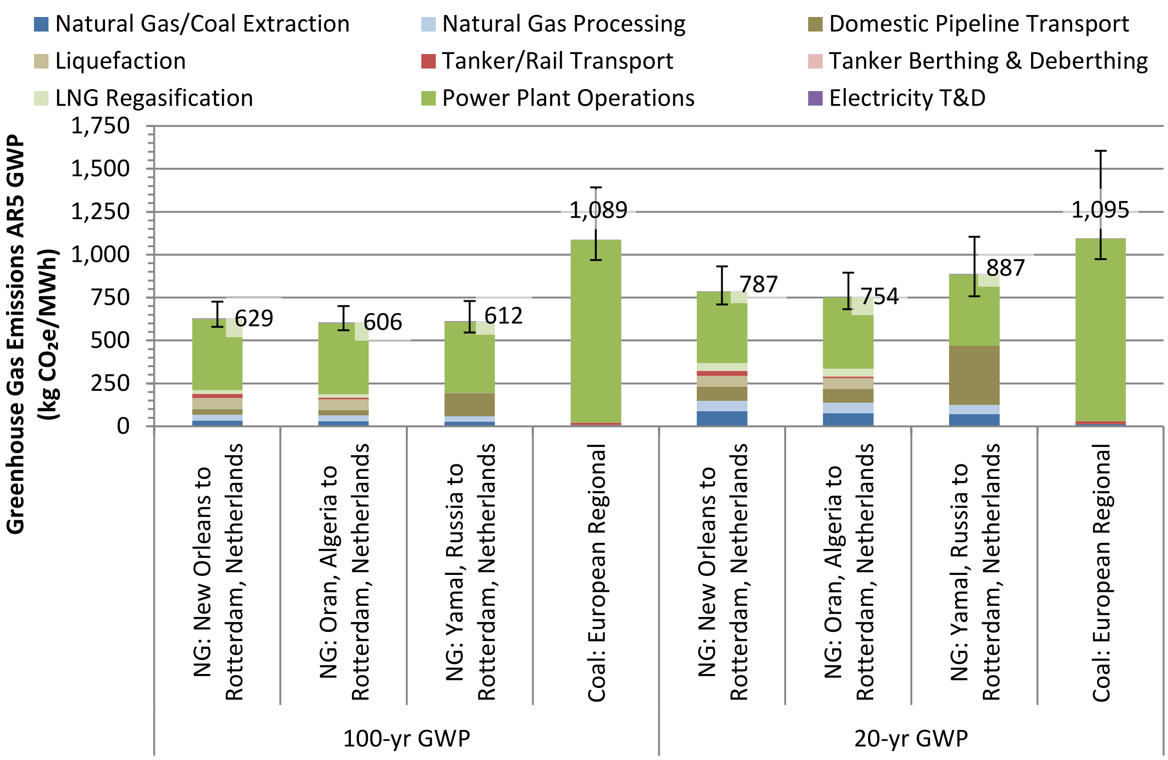
Table 5-6: Parameters for Natural Gas Transmission by Pipeline

Property (Units)	Value (Uncertainty)
Pipeline Transport Distance (km)	971 (777 – 1,166)
Distance Between Compressors (km)	121
Compressor, Gas-powered Reciprocating (%)	78%
Compressor, Gas-powered Centrifugal (%)	19%
Compressor, Electrical, Centrifugal (%)	3%

6 Results

The LCA results for natural gas and coal power generation in Europe and Asia are shown in **Figure 6-1** and **Figure 6-2**, respectively. The results in both figures are shown on both 100-year and 20-year GWP time frames, which is especially important due to the uncaptured venting and fugitive emissions of methane in natural gas systems. Detailed results for all of the scenarios in these figures are provided in the Appendix for both AR4 and AR5 GWPs. It is important to note that the results from this analysis bracket the range of variability based on the cumulative change to the key parameters. **Figure 6-1** and **Figure 6-2** report an expected value for each of the scenarios. These values should not be interpreted as the most likely values due to the wide range of scenario variability and uncertainty in the underlying modeled data. Rather, the expected values allow for the evaluation of the contribution of each of the major processes to the total life cycle emissions (e.g. extraction, transport, combustion). The results should be interpreted as general guidance to provide perspective on trends only and not as prescriptive, scenario-specific results.

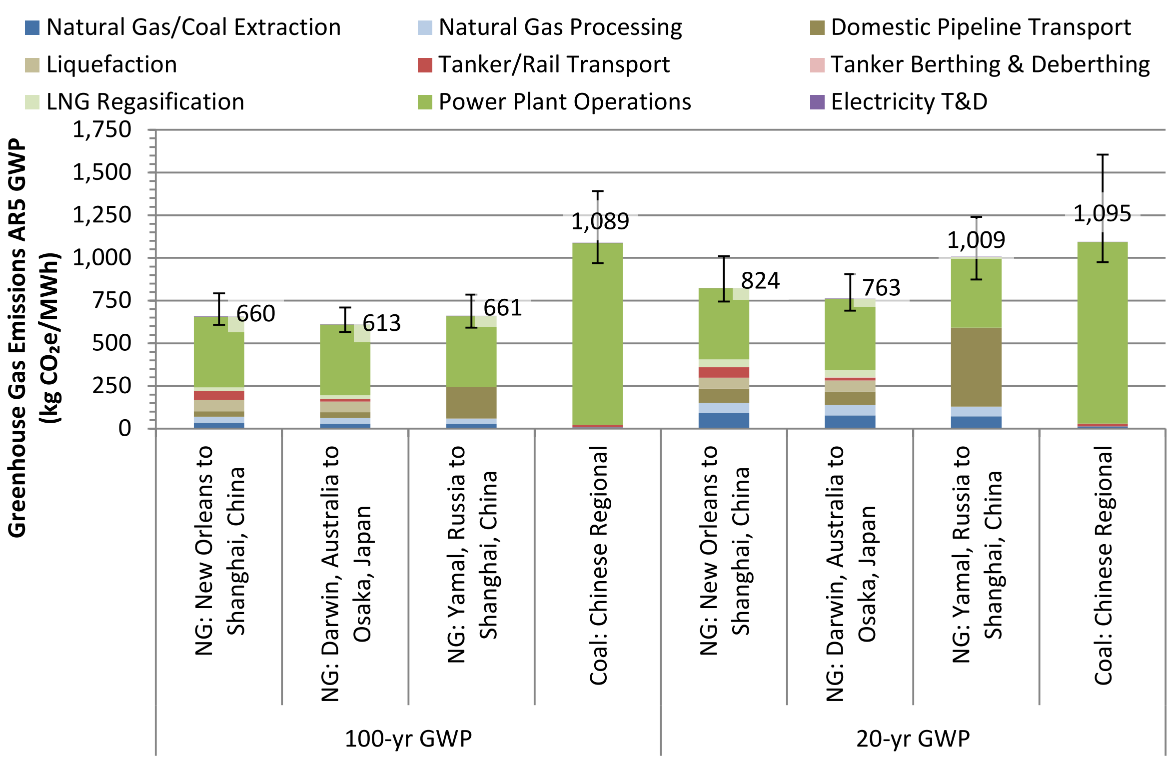
Figure 6-1: Life Cycle GHG Emissions for Natural Gas and Coal Power in Europe



In general, the results from **Figure 6-1** and **Figure 6-2** indicate that for most scenarios in both the European and Asian regions, the generation of power from imported natural gas has lower life cycle GHG emissions than power generation from regional coal. On the basis of a 20-year GWP, there is some overlap in the uncertainty bars for the Russian natural gas and regional coal cases for both Europe and Asia. Additionally, there is a small overlap between the uncertainty bars for the U.S. LNG to Shanghai case and regional coal case on a 20-year GWP basis. It is important to note that this overlap is based on an assumption of high methane leakage (1.6%) and low power plant efficiency (41.2%) for U.S. LNG and low methane content (8 scf/ton) and high power plant efficiency (36.7%) for regional coal. Given the uncertainty in the underlying model data, it is not clear if there are any significant differences between the corresponding European and Asian cases other than the LNG transport distance from the U.S. and the pipeline distance from Russia. Differences between the U.S LNG, regional LNG, and Russian natural gas options are also indeterminate on a 100-year GWP basis due to the underlying uncertainty in the modeling data, therefore no significant increase or decrease in net climate impact is anticipated from any of these scenarios. It is important to note that the European and Asian coal scenarios are identical because the same parameter ranges are used for both.

Both figures show that the majority of GHG emissions come from combustion at the power plant; however, the contributions from the upstream acquisition of the two fuels are very different. For the natural gas scenarios, 31 to 37 percent of the life cycle emissions are from the natural gas supply chain, compared to 1.3 percent for coal on a 100-year basis. On a 20-year basis, the upstream share for the natural gas scenarios increases to 45 to 59 percent, compared to 1.4 percent for coal, due to high global warming potential associated with methane. The results show that the LNG and Russian natural gas cases produce essentially the same amount of GHG emissions on a 100-year basis. The emissions from the steps involved in LNG (liquefaction, tanker transport, and regasification) are approximately equal to the pipeline transport emissions for the Russian natural gas cases. However, when comparing the scenarios on a 20-year basis, the difference between the LNG and Russian natural gas cases is more significant. This is driven by the pipeline contribution to the Russian natural gas GHG results. The majority of pipeline emissions are methane, which has a much higher GWP on a 20-year basis. The natural gas power results are based on U.S natural gas production in 2010. The results do not include the anticipated 30 percent reduction in upstream life cycle greenhouse gas emissions for new marginal unconventional wells in compliance with EPA's 2012 New Source Performance Standards (NSPS) for the oil and gas sector. On a complete life cycle basis through power production the net reduction would be approximately 3.4 percent for the U.S. LNG scenarios and 7.4 percent for the Russian natural gas scenarios. This is based on the assumption that the Russian natural gas industry would implement the same changes as prescribed for the U.S.

Figure 6-2: Life Cycle GHG Emissions for Natural Gas and Coal Power in Asia



Compared to domestically produced and combusted gas, there is a significant increase in the life cycle GHG emissions that are attributed to the LNG supply chain, specifically from liquefaction, tanker transport, and regasification processes. **Figure 6-3** shows the speciated GHGs from the key processes in the natural gas power production life cycle for the U.S. LNG to Rotterdam scenario on a 100-yr GWP basis. The liquefaction, ocean transport, and regasification of natural gas are energy intensive activities with significant GHG emissions, accounting for 17.5 percent of the cradle-to-grave emissions in this scenario. For comparison, the natural gas extraction, processing, and transport activities in the exporting country (either U.S. or regional) account for 16.0 percent of the cradle-to-grave emissions. In this study, Marcellus Shale natural gas is used as an example, but the same patterns would be shown for other types of natural gas. As shown by **Figure 6-3**, methane emissions account for 13.8 percent of the total life cycle GHG emissions, while CO_2 accounts for 85.5 percent. The total emissions from the plant stack account for 65.9 percent of the total life cycle GHG emissions.

For comparison, a speciated GHG drilldown is also shown for the Russian natural gas to Rotterdam scenario in **Figure 6-4** on a 100-yr GWP basis. In that scenario, methane emissions account for 24.6 percent of the total life cycle GHG emissions, while CO_2 accounts for 74.8 percent. In the Russian scenario, 67.7 percent of the total life cycle GHG emissions are direct emissions from the power plant stack. The increased percentage of methane emissions is the result of larger methane leakage due to the longer pipeline distance. As previously mentioned, the emissions from the steps involved in LNG (liquefaction, tanker transport, and regasification) are approximately equal to the pipeline transport emissions for the Russian natural gas cases.

Figure 6-5 shows a speciated GHG drilldown for the coal power production case on a 100-yr GWP basis. Methane emissions, primarily from releases during coal mining, account for 0.4 percent of the total life cycle GHG emissions, compared to 98.8 percent for CO_2. The contribution of methane to the total life cycle GHG emissions for the coal scenario is significantly less than for the natural gas scenarios. For the coal power plant, 97.7 percent of the total GHG emissions come directly from power plant stack emissions. As shown by the figures, the upstream extraction, processing, and transport emissions are much more significant for the natural gas supply chain than for coal.

Figure 6-3: Speciated Life Cycle GHG Emissions of Natural Gas Power – U.S. LNG to Rotterdam Scenario

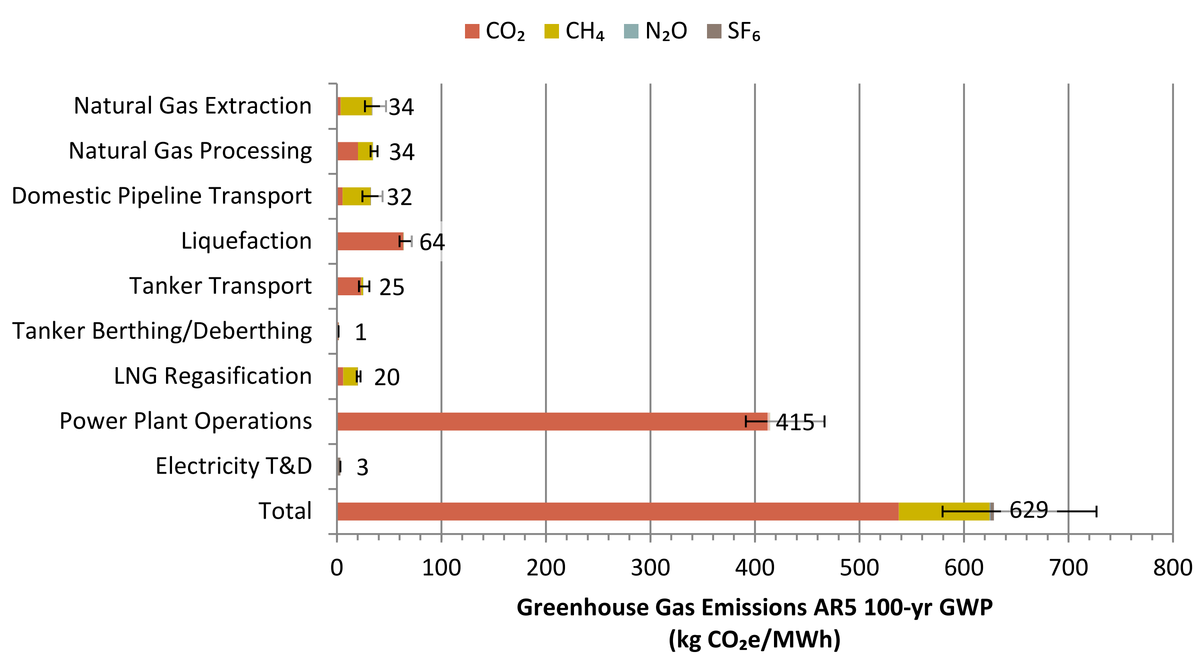


Figure 6-4: Speciated Life Cycle GHG Emissions of Natural Gas Power – Russian NG to Rotterdam Scenario

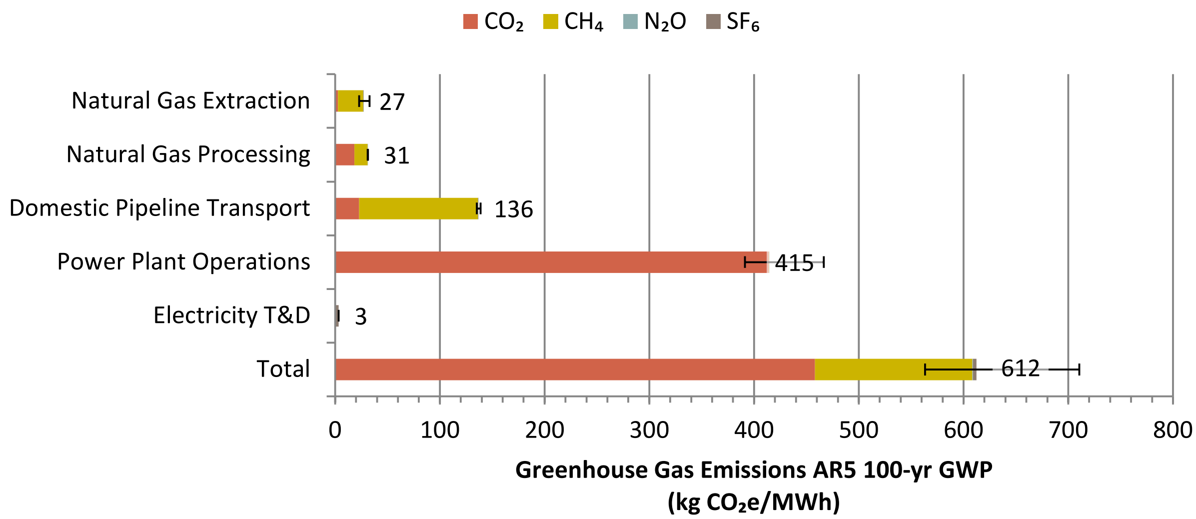


Figure 6-5: Speciated Life Cycle GHG Emissions of Coal Power

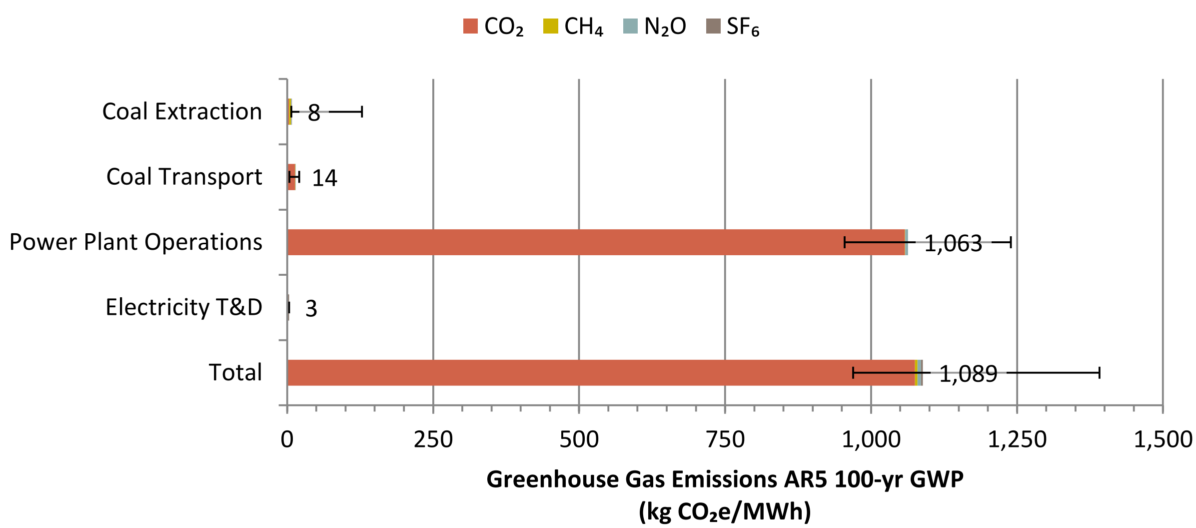


Figure 6-6 and **Figure 6-7** utilize the uncertainty bands shown in **Figure 6-1** and **Figure 6-2** to compare the range of LC GHG emissions for the gas and coal scenarios in Europe and Asia on 100 and 20-year bases. On a 100-year basis, natural gas power is 25 to 61 percent less than coal for Europe and 18 to 59 percent less than coal for Asia. The small difference in the ranges for Europe and Asia is driven by the longer transport distances for natural gas to Asia (both LNG from the U.S. and pipeline from Russia). On a 20-year basis, there is still potential for natural gas to have lower GHG emissions than coal (up to 57 percent less); however, the high end of the Russian gas results overlap with the low range of the coal results for both Europe and Asia and the high end of the U.S LNG results overlap with the coal results for Asia. As noted, the 20-year GWP emissions for the Russian natural gas scenarios are driven by the methane emissions from pipeline transport. The estimated pipeline distances for Russian natural gas transport are roughly four to eight times longer than for the LNG cases.

Figure 6-6: 100-yr GWP comparison of Coal and NG Power in Europe and Asia

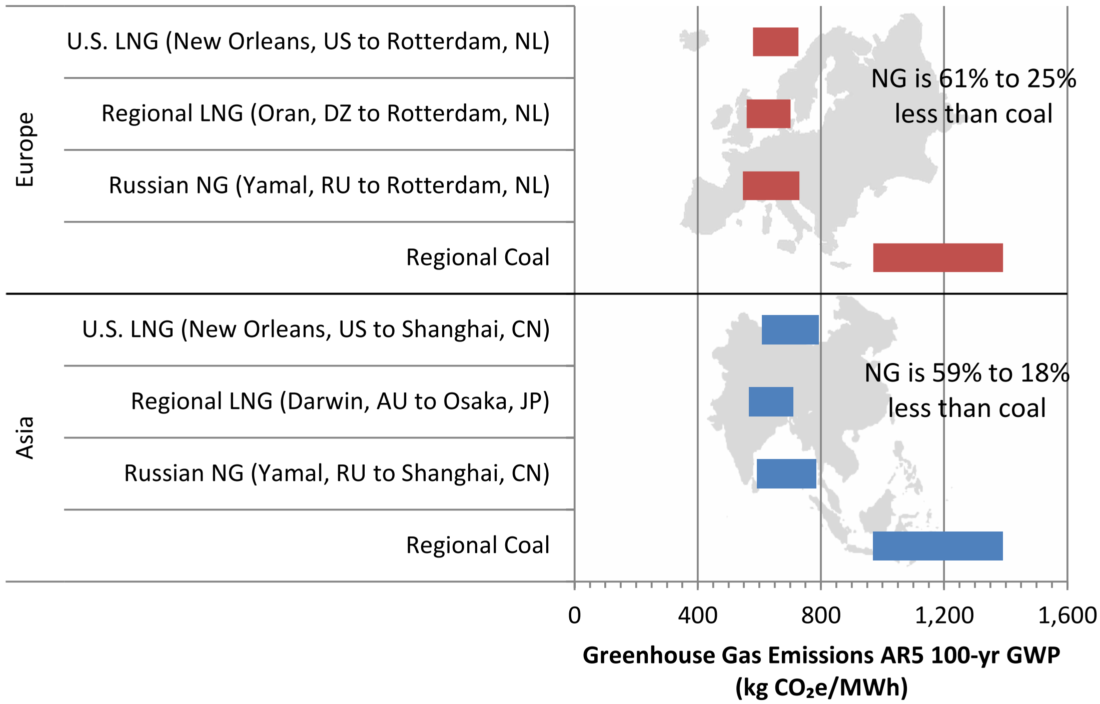


Figure 6-7: 20-yr GWP comparison of Coal and NG Power in Europe and Asia

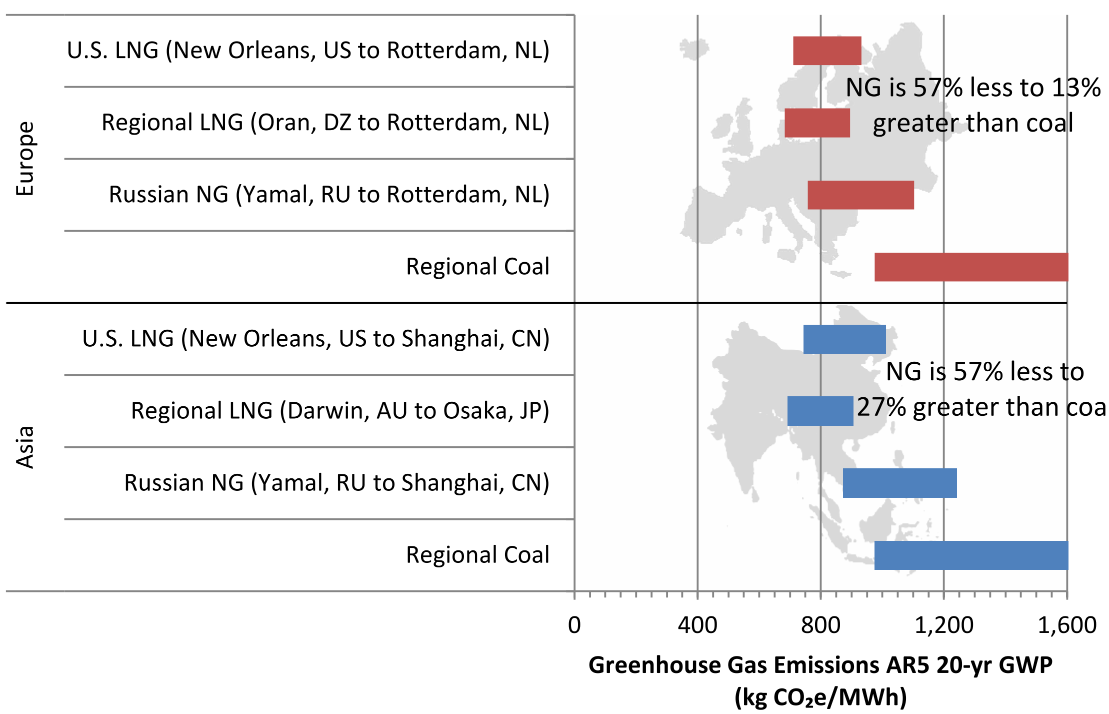


Figure 6-8 and **Figure 6-9** depict the life cycle GHG emissions for the U.S. LNG and Russian natural gas scenarios as a function of the methane leakage that occurs during extraction, processing, and transport on a 100-year and 20-year basis, respectively. Both figures also include a reference line for the coal power scenario. The diamond-shaped data points represent the modeled leakage for each scenario and the circular data points represent the breakeven leakage at which the life cycle GHG emissions for natural gas power would equal those for the coal reference case. These results are based on the most conservative breakeven point which occurs between the high natural gas cases (i.e. lowest power plant efficiency, longest transport distance, and highest methane leakage) with the low coal case (i.e. highest power plant efficiency and shortest transport distance). All of the breakeven results are compiled in **Table 6-1**.

Methane leakage (cradle-to-delivered) from natural gas production would have to increase by a factor of 2.8 before the high estimate for U.S. LNG exports would overlap the low estimate for regional coal production and consumption for power production for the U.S. to Shanghai scenario on a 100-year GWP basis. The leakage could increase by a factor of 3.6 for the European case, slightly higher due to the shorter transport distance between the U.S. and Rotterdam. The breakeven methane leakage for the Asian scenario is 4.6 percent and 5.8 percent for the European scenario.

For the Russian natural gas to Shanghai scenario, methane leakage (cradle-to-delivered) from natural gas production would have to increase 1.7 times before the high estimate for natural gas would overlap the low estimate for regional coal production and consumption for power production on a 100-year GWP basis. The leakage could increase by a factor of 2.2 for the European case, slightly higher due to the shorter pipeline distance. The breakeven methane leakage for the Asian scenario is 8.8 percent and 8.9 percent for the European scenario.

Figure 6-9 presents the same scenarios on a 20-year GWP basis. The high modeled leakage rate for the U.S. LNG scenarios (1.6 percent) is still less than the breakeven percentage for the European scenario (1.9 percent), but slightly higher than the breakeven for the Asian scenario (1.4 percent). The current leakage rates for the Russian natural gas scenarios are higher than the breakeven percentages for the corresponding scenarios on a 20-year basis. This corresponds to the results shown in **Figure 6-7**, which shows that there is some overlap in the uncertainty bands for the Russian natural gas scenarios and the reference coal scenario on a 20-year GWP basis. As previously noted, the calculated breakeven points are the most conservative, so these results do not indicate that natural gas has a higher GHG than coal on a 20-year basis in all cases.

Table 6-1: Coal and Natural Gas Breakeven for U.S. LNG and Russian NG Scenarios

Scenario	Modeled Leakage	Breakeven Leakage		X Times Higher Than Modeled Leakage	
		100-yr GWP	20-yr GWP	100-yr GWP	20-yr GWP
U.S. LNG to Rotterdam	1.6%	5.8%	1.9%	3.6	1.2
U.S. LNG to Shanghai	1.6%	4.6%	1.4%	2.8	0.9
Russia NG to Rotterdam	4.1%	8.9%	3.2%	2.2	0.8
Russia NG to Shanghai	5.0%	8.8%	3.1%	1.7	0.6

Figure 6-8: Coal and Natural Gas Breakeven for U.S. LNG and Russian NG Scenarios (100-year GWP)

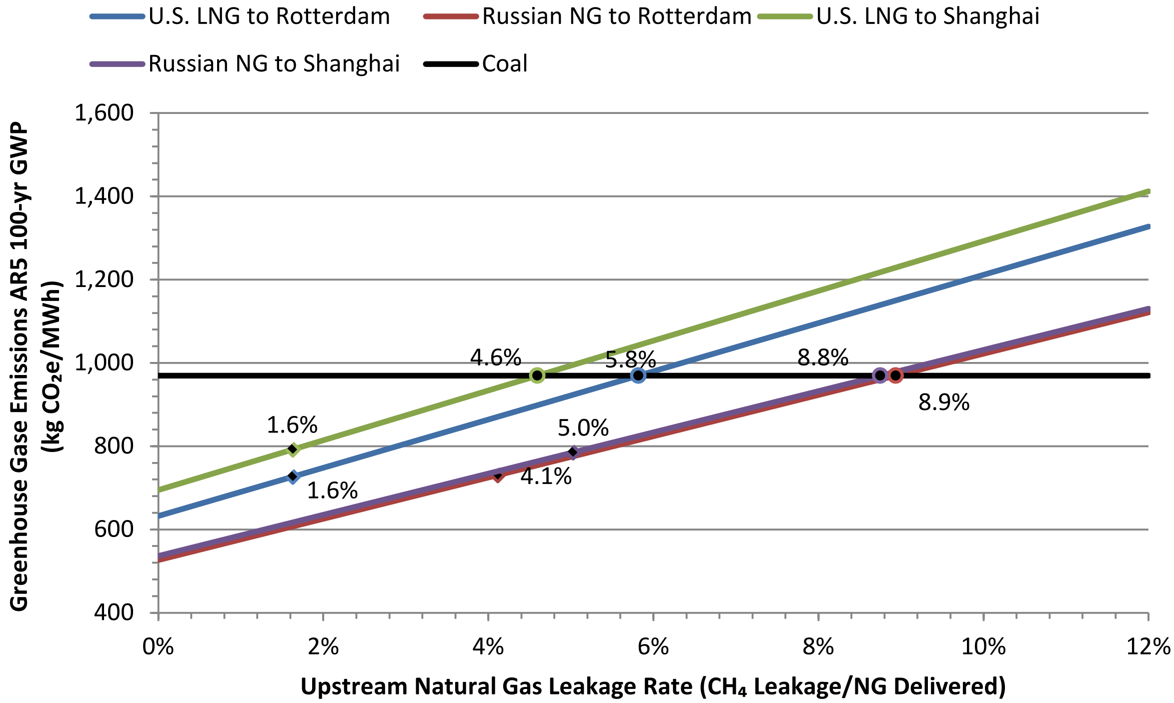


Figure 6-9: Coal and Natural Gas Breakeven for U.S. LNG and Russian NG Scenarios (20-year GWP)

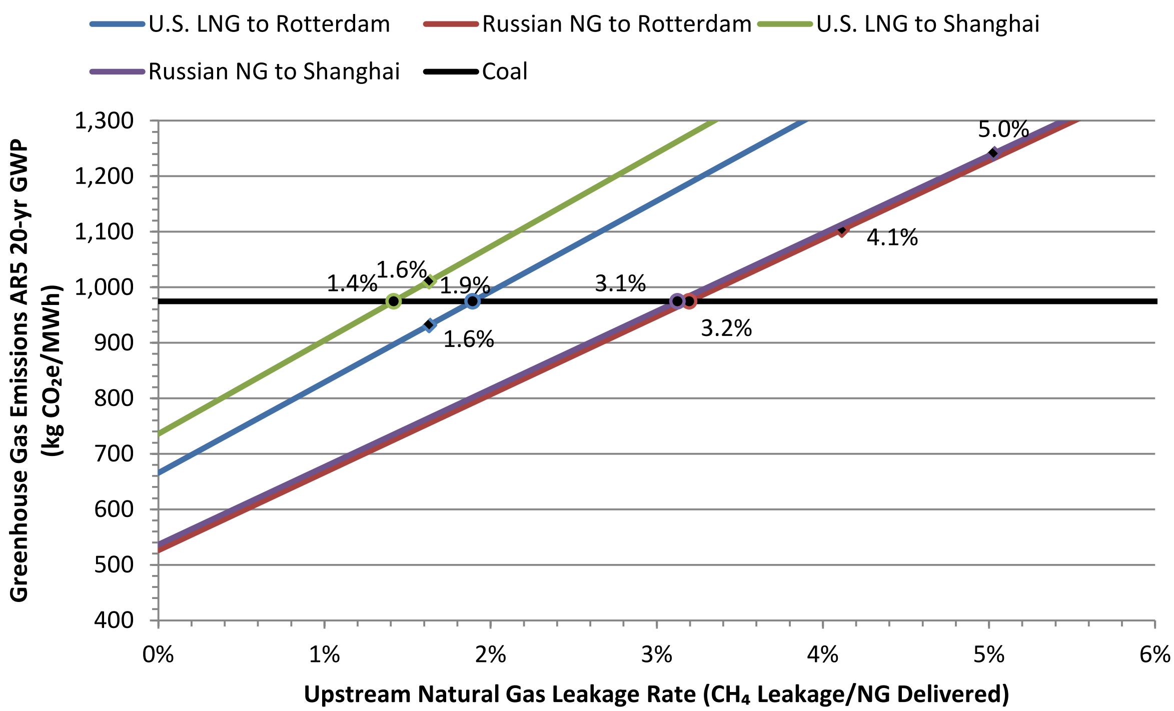


Figure 6-10 through **Figure 6-16** are uncertainty tornado diagrams for each of the 100-year GWP scenarios from **Figure 6-1** and **Figure 6-2**. The parameter ranges for these figures are based on the values in **Table 5-1**, **Table 5-2** and **Table 5-3**. These figures show the uncertainty in the total life cycle results based on changes to only a single parameter or variable.

As expected, the power plant efficiency contributes a significant fraction of the uncertainty for the natural gas and coal scenarios. These figures generally indicate that the transport of LNG contributes very little uncertainty to the overall result, except in the New Orleans to Shanghai LNG case. The base case assumption for that scenario is that the LNG tanker travels to Shanghai via the Panama Canal. In the event that this is not possible due to ship dimensions, the transport distance increases by approximately 50 percent. The emissions associated with the extraction and processing of natural gas do contribute considerably to the uncertainty of the overall emissions. For more details on the factors the drive the uncertainty of upstream natural gas extraction, refer to the NETL Life Cycle Analysis of Natural Gas Extraction and Power Generation (NETL, 2014). For the Russian natural gas cases shown in **Figure 6-14** and **Figure 6-15**, uncertainty in the pipeline transport distance results is a large driver in the overall uncertainty of the life cycle result. As previously noted, the exact distance the natural gas travels from the extraction point in Yamal to the destination power plant is unknown, so a wide range spanning 2,000 km from low to high was used to represent all potential scenarios. It should be noted that the type of coal used at the power plant does account for some uncertainty in the model. The high case utilizes I-6 coal, which has higher acquisition emissions due to higher methane emissions at the coal mine.

Figure 6-10: Uncertainty Tornado LNG – New Orleans to Rotterdam, Netherlands

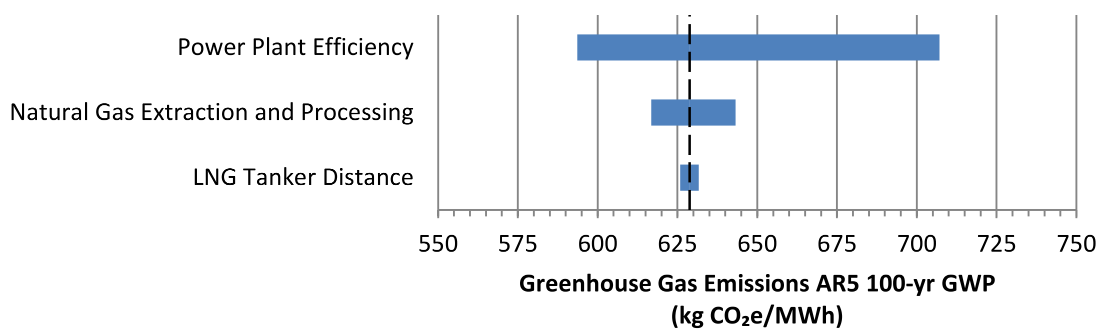


Figure 6-11: Uncertainty Tornado LNG – Oran, Algeria to Rotterdam, Netherlands

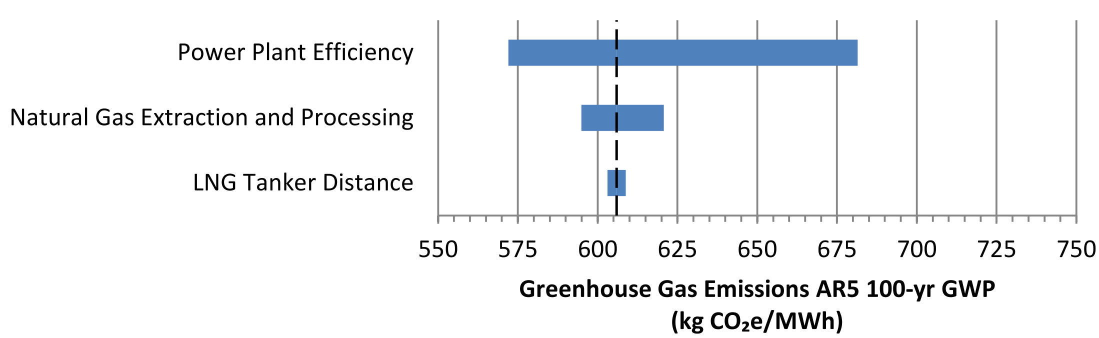


Figure 6-12: Uncertainty Tornado LNG – New Orleans to Shanghai, China

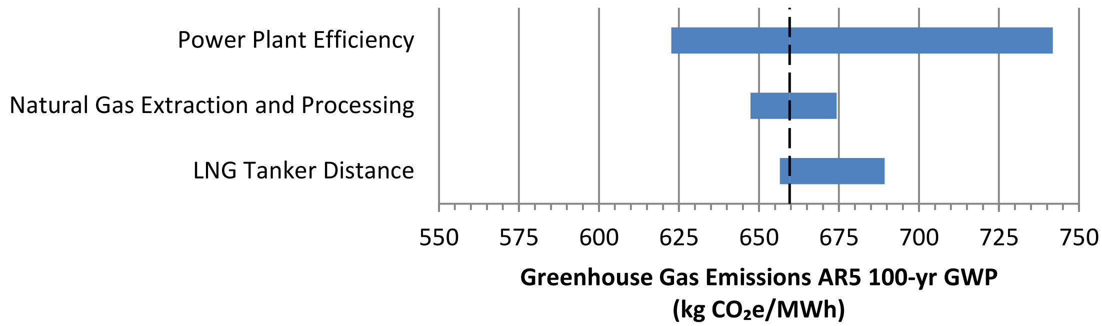


Figure 6-13: Uncertainty Tornado LNG – Darwin, Australia to Osaka, Japan

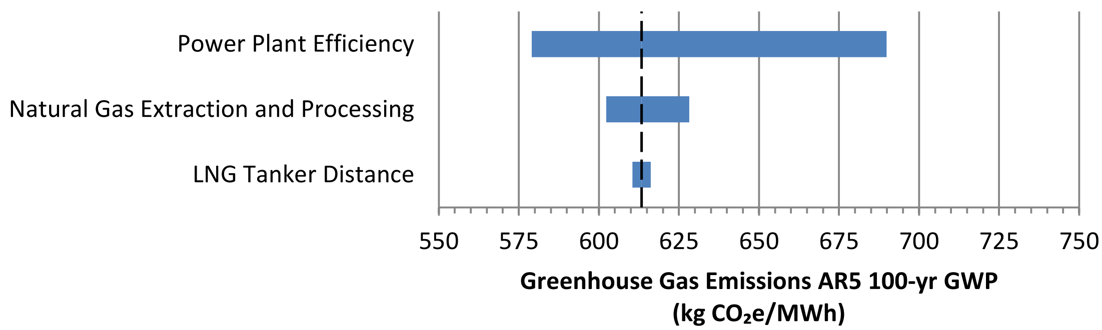


Figure 6-14: Uncertainty Tornado Russian NG – Yamal, Russia to Rotterdam, Netherlands

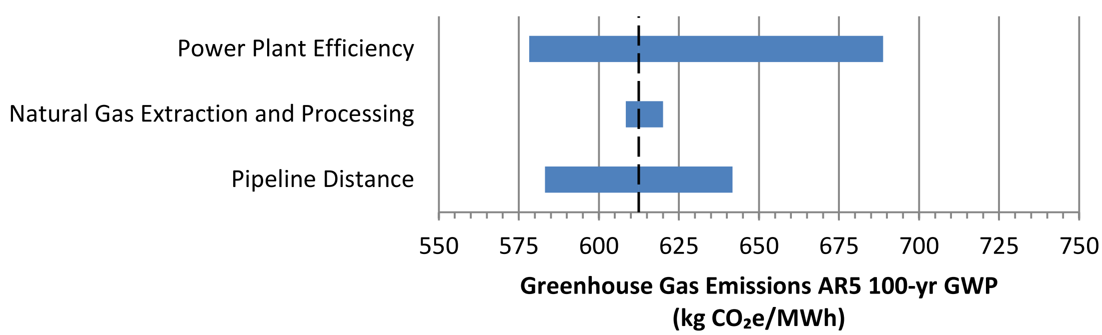


Figure 6-15: Uncertainty Tornado Russian NG – Yamal, Russia to Shanghai, China

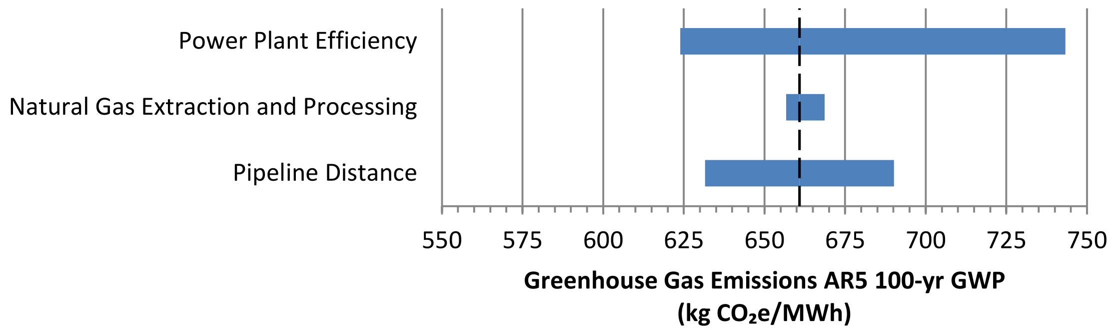
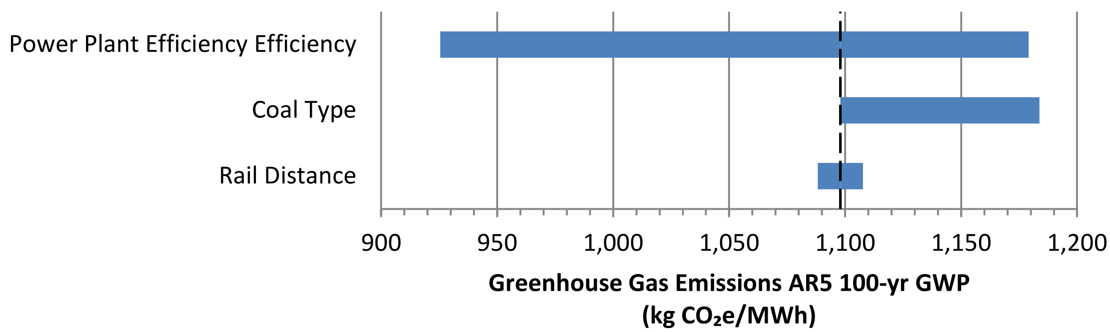


Figure 6-16: Uncertainty Tornado Coal – Europe and Asia Regional Production



7 Summary and Study Limitations

This analysis has determined that the use of U.S. LNG exports for power production in European and Asian markets will not increase GHG emissions, on a life cycle perspective, when compared to regional coal extraction and consumption for power production. Given the uncertainty in the underlying model data, it is not clear if there are any significant differences between the corresponding European and Asian cases other than the LNG transport distance from the U.S. and the pipeline distance from Russia. Differences between the U.S LNG, regional LNG, and Russian natural gas options are also indeterminate due to the underlying uncertainty in the modeling data, therefore no significant increase or decrease in net climate impact is anticipated from any of these scenarios. It is important to note that the European and Asian coal scenarios are identical because the same parameter ranges are used for both.

A limitation of this study is that the NETL natural gas life cycle analysis model and NETL coal life cycle analysis model are U.S.-based models that were adapted for foreign natural gas and coal production as well as power generation. The specific LNG export/import locations used in this study were chosen to represent an estimate for a region (e.g. New Orleans as U.S. Gulf Coast). Specific locations were required to allow for the estimation of LNG transport distances and do not imply the likelihood that LNG export or import will occur from that exact location. The same assumptions hold true for the Russian natural gas cases. Another limitation is that the efficiencies and other end uses for regional fuel alternatives are not considered.

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Appendix A – Life Cycle Results in IPCC AR4 and AR5 GWPs

Table A-1: Life Cycle GHG Emissions for Natural Gas and Coal Power in Europe IPCC AR-4 GWP A-2
Table A-2: Life Cycle GHG Emissions for Natural Gas and Coal Power in Asia IPCC AR-4 GWP A-3
Table A-3: Life Cycle GHG Emissions for Natural Gas and Coal Power in Europe IPCC AR-5 GWP A-4
Table A-4: Life Cycle GHG Emissions for Natural Gas and Coal Power in Asia IPCC AR-5 GWP A-5

Table A-1: Life Cycle GHG Emissions for Natural Gas and Coal Power in Europe IPCC AR-4 GWP (kg CO_2e/MWh)

Life Cycle Process	100-yr GWP				20-yr GWP			
	New Orleans to Rotterdam, Netherlands	Oran, Algeria to Rotterdam, Netherlands	Yamal, Russia to Rotterdam, Netherlands	European Regional Coal	New Orleans to Rotterdam, Netherlands	Oran, Algeria to Rotterdam, Netherlands	Yamal, Russia to Rotterdam, Netherlands	European Regional Coal
Natural Gas/Coal Extraction	29.0	24.9	22.8	7.8	75.8	65.8	60.3	13.6
Natural Gas Processing	32.1	31.8	29.1	N/A	54.3	53.7	49.2	N/A
Domestic Pipeline Transport	27.8	27.5	117.5	N/A	69.8	69.1	295.1	N/A
Liquefaction	63.6	62.9	N/A	N/A	63.6	62.9	N/A	N/A
Tanker/Rail Transport	24.7	8.0	N/A	14.4	27.6	9.0	N/A	15.3
Tanker Berthing & Deberthing	1.5	1.5	N/A	N/A	1.6	1.6	N/A	N/A
LNG Regasification	17.7	17.7	N/A	N/A	39.3	39.3	N/A	N/A
Power Plant Operations	414.7	414.7	414.7	1,063.0	415.2	415.2	415.2	1,063.7
Electricity T&D	3.3	3.3	3.3	3.4	2.3	2.3	2.3	2.5
Total	614.3	592.3	587.4	1,088.6	749.4	719.0	822.1	1,095.1
Low	567.5	547.6	527.4	969.4	679.2	652.9	707.9	974.6
High	708.0	683.6	696.4	1,391.4	883.0	849.2	1,015.0	1,604.2

Table A-2: Life Cycle GHG Emissions for Natural Gas and Coal Power in Asia IPCC AR-4 GWP (kg CO_2e/MWh)

Life Cycle Process	100-yr GWP				20-yr GWP			
	New Orleans to Shanghai, China	Darwin, Australia to Osaka, Japan	Yamal, Russia to Shanghai, China	Chinese Regional Coal	New Orleans to Shanghai, China	Darwin, Australia to Osaka, Japan	Yamal, Russia to Shanghai, China	Chinese Regional Coal
Natural Gas/Coal Extraction	29.5	25.0	23.3	7.8	77.1	66.1	61.7	13.6
Natural Gas Processing	32.7	31.9	29.8	N/A	55.2	53.9	50.3	N/A
Domestic Pipeline Transport	28.3	27.7	158.1	N/A	71.0	69.4	396.9	N/A
Liquefaction	64.7	63.2	N/A	N/A	64.7	63.2	N/A	N/A
Tanker/Rail Transport	52.3	14.7	N/A	14.4	58.4	16.5	N/A	15.3
Tanker Berthing & Deberthing	1.5	1.5	N/A	N/A	1.6	1.6	N/A	N/A
LNG Regasification	17.7	17.7	N/A	N/A	39.3	39.3	N/A	N/A
Power Plant Operations	414.7	414.7	414.7	1,063.0	415.2	415.2	415.2	1,063.7
Electricity T&D	3.3	3.3	3.3	3.4	2.3	2.3	2.3	2.5
Total	644.6	599.6	629.1	1,088.6	784.8	727.5	926.5	1,095.1
Low	595.8	554.5	566.8	969.4	712.1	660.8	806.2	974.6
High	772.2	691.9	743.5	1,391.4	958.7	858.9	1,133.0	1,604.2

Table A-3: Life Cycle GHG Emissions for Natural Gas and Coal Power in Europe IPCC AR-5 GWP (kg CO_2e/MWh)

Life Cycle Process	100-yr GWP				20-yr GWP			
	New Orleans to Rotterdam, Netherlands	Oran, Algeria to Rotterdam, Netherlands	Yamal, Russia to Rotterdam, Netherlands	European Regional Coal	New Orleans to Rotterdam, Netherlands	Oran, Algeria to Rotterdam, Netherlands	Yamal, Russia to Rotterdam, Netherlands	European Regional Coal
Natural Gas/Coal Extraction	33.9	29.3	26.8	7.8	88.7	77.2	70.6	13.6
Natural Gas Processing	34.5	34.1	31.2	N/A	60.4	59.7	54.7	N/A
Domestic Pipeline Transport	32.3	32.0	136.4	N/A	81.4	80.6	344.2	N/A
Liquefaction	63.6	62.9	N/A	N/A	63.6	62.9	N/A	N/A
Tanker/Rail Transport	25.0	8.1	N/A	14.4	28.4	9.2	N/A	15.3
Tanker Berthing & Deberthing	1.5	1.5	N/A	N/A	1.6	1.6	N/A	N/A
LNG Regasification	20.0	20.0	N/A	N/A	45.3	45.3	N/A	N/A
Power Plant Operations	414.7	414.7	414.7	1,063.0	415.3	415.3	415.3	1,063.7
Electricity T&D	3.4	3.4	3.4	3.4	2.5	2.5	2.5	2.5
Total	628.8	605.9	612.5	1,088.6	787.2	754.4	887.4	1,095.1
Low	579.5	559.0	546.8	969.4	710.5	682.4	758.2	974.6
High	726.7	701.4	730.4	1,391.4	931.8	895.3	1,103.5	1,604.2

Table A-4: Life Cycle GHG Emissions for Natural Gas and Coal Power in Asia IPCC AR-5 GWP (kg CO_2e/MWh)

Life Cycle Process	100-yr GWP				20-yr GWP			
	New Orleans to Shanghai, China	Darwin, Australia to Osaka, Japan	Yamal, Russia to Shanghai, China	Chinese Regional Coal	New Orleans to Shanghai, China	Darwin, Australia to Osaka, Japan	Yamal, Russia to Shanghai, China	Chinese Regional Coal
Natural Gas/Coal Extraction	34.5	29.4	27.4	7.8	90.2	77.5	72.3	13.6
Natural Gas Processing	35.1	34.3	32.0	N/A	61.4	60.0	56.0	N/A
Domestic Pipeline Transport	32.9	32.1	183.5	N/A	82.9	80.9	463.0	N/A
Liquefaction	64.7	63.2	N/A	N/A	64.7	63.2	N/A	N/A
Tanker/Rail Transport	52.9	14.9	N/A	14.4	60.1	16.9	N/A	15.3
Tanker Berthing & Deberthing	1.5	1.5	N/A	N/A	1.6	1.6	N/A	N/A
LNG Regasification	20.0	20.0	N/A	N/A	45.3	45.3	N/A	N/A
Power Plant Operations	414.7	414.7	414.7	1,063.0	415.3	415.3	415.3	1,063.7
Electricity T&D	3.4	3.4	3.4	3.4	2.5	2.5	2.5	2.5
Total	659.6	613.4	660.9	1,088.6	824.0	763.2	1,009.1	1,095.1
Low	608.3	565.9	592.4	969.4	744.6	690.6	872.8	974.6
High	792.1	709.8	785.1	1,391.4	1,010.7	905.5	1,241.1	1,604.2

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We the undersigned landowners along the Pacific Connector pipeline route, agree with the Protest/Comments submitted by Landye Bennett Blumstein LLP Attorneys, May 9th, 2018, on behalf of landowners: Evans Schaaf Family LLC, Ronald Schaaf, Deborah Evans, Stacey and Craig McLaughlin, Oregon Women's Land Trust, Landowners United, Bob Barker, Bill Gow, John Clarke, Clarence Adams and Pamela Brown Ordway.

C2 Cattle Company, James R Coonan	18495 Hwy 140 Eagle Point, OR 97524
James and Joan Dahlman	344 HONEY RUN LANE WINSTON, OR 97496
Nikki Amos	1084 Burma Rd Camas Valley, OR, 97416
Russ Lyon	3880 Days Creek Rd., Days Creek, OR 97429
Juanita Saul	1272 KIRKENDAHL Rd, CAMAS VALLEY, OR 97416
Joseph Patrick Quinn	251 Wildcat Rd Camas Valley, OR, 97416
Alisa Acosta	536 Ragsdale Road, Trail, OR 97541
Wanda Baker	3901 Mack Ave., Klamath Falls, OR 97603
Richard and Twyla Brown	2381 Upper Camas Rd Camas Valley, OR 97416
Barbara L Brown	4864 SW Wembley Place, Beaverton, OR 97005
Kenneth and Kristine Cates	1688 Denn Road Camas Valley, OR 97416
John Caughell	61982 Old Wagon Rd, Coos Bay Or
Katherine	18809 Hill Rd, Klamath Falls, OR 97603
Linda Craig	119 LOPER LN TRAIL, OR 97541
James and Archina Davenport	61954 Old Wagon Rd. Coos Bay, OR 97420
Booth Devitt	PO Box 315, Trail, Or. 97541
Suzanne Dickson	3181 Fisher Rd. Roseburg, Oregon 97471
Don Eichmann	3170 Days Creek Road, Days Creek, OR 97429
Tammy Eichmann	3170 Days Creek Road, Days Creek, OR 97429
Nicholas Garcia	20136 Crystal Mountain Ln Bend, OR
David Hopkins	58344 FAIRVIEW RD, COQUILLE, OR 97423
Kevin D. Jenkins	7829 Skycrest Dr, Klamath Falls, Oregon 97601
Marcella Laudani	PO Box 71 Shady Cove OR 97539
Lori Lester	3620 OLD MIDLAND RD, KLAMATH FALLS, OR 97603
Larry and Sylvia Mangan	93780 Hillcrest Lane, North Bend, OR. 97459
Chris & Elizabeth Mathas	P.O. Box #81 Medford, Or 97501
William McKinley	45 Hickory Ave, Corte Madera, CA 94925
James Moore	7818 Skyview Circle, Klamath Falls, Oregon 97601
Brian Nicolson	42263 Skiway Drive, Klamath Falls, Oregon 97601
Curtis and Melissa Pallin	62225 Catching Slough Rd., Coos Bay, OR, 97420
Chris Press	P.O.B. 607 Coos Bay, OR 97420
John Shoffner	921 Mountain View Drive, eagle Point, OR 97524
Paul (Mike) M. Washburn	61829 Old Wagon Rd. Coos Bay, OR 97420
Judy Faye Whitson	2002 Kent Creek Road, Winston OR 97496
Gerald & Robin Wisdom	1260 Arcadia Drive, Roseburg OR 97471
Toni Woolsey	PO Box 151, Trail, OR 97541
Keri Wu	340 Taylor Rd, Trail OR 97541
Robin Lee	415 Sunrise Ave, Medford, 97504
Donna Long	94591 Skyline Drive, Coos Bay, OR 97420

http://business.financialpost.com/commodities/energy/with-montney-assets-buy-veresen-eyes-building-first-west-coast-lng-facility-in-oregon

With Montney assets buy, Veresen eyes building first West Coast LNG facility in Oregon

President and CEO of Veresen Inc. made a bold prediction – that his company would be the first to build an LNG project on the West Coast, but that it would be built in the U.S.

GEOFFREY MORGAN

December 23, 2014
6:26 PM EST

CALGARY – Shortly after his company minted a $600 million deal to buy up natural gas pipelines and processing facilities in northwestern Alberta, the president and CEO of Veresen Inc. made a bold prediction – that his company would be the first to build an LNG project on the West Coast, but that it would be built in the U.S.

Veresen chief Don Althoff said in an interview Tuesday that his Calgary-based company's Jordan Cove LNG project, proposed for the Oregon coastline, "could very well be the first West Coast LNG facility up and running."

Mr. Althoff also confirmed that his company intends to make a final investment decision on the project in the second half of 2015.

Vern Wadey, Veresen's vice-president of Jordan Cove and the person responsible for the project, was even bolder. "I would predict that Jordan Cove will be the first LNG facility constructed on the West Coast of North America – I think it stands a good chance to achieve that," Mr. Wadey said.

Jordan Cove, which would supercool about 1 billion cubic feet of natural gas per day into a liquid state for export to Asian markets, is awaiting final regulatory approvals from the U.S. Federal Energy Regulatory Commission.

Mr. Althoff also said that Veresen's deal for Encana's natural gas pipelines and facilities in northwestern Alberta could benefit its LNG plans.

Veresen announced Monday that it had struck a $600 million deal with Encana Corp. and Mitsubishi Corp. to acquire natural gas pipelines and compression facilities in northwestern Alberta's Montney play. Under the terms of the deal, Encana will receive $412 million.

"We think it's a big, prolific field," Mr. Althoff said of the Montney, which is a liquids-rich natural gas play – meaning that much-sought-after chemical compounds like butane are also found in the gas produced there.

In announcing the deal, Calgary-based Veresen and New York-based private equity firm Kohlberg Kravis Roberts & Co. LP announced plans to create a jointly owned subsidiary that would invest $5 billion in that same Montney formation to service Encana's and Mitsubishi's drilling plans.

Asked whether access to the liquids-rich Montney, whose compounds are in high demand in Asia, was part of a wider strategy to link gas assets with Veresen's proposed LNG project, Mr. Althoff said the two were intended to stand alone – but would work well together.

"There are some synergies [between the field and the LNG terminal], because the buyers we're talking to need to find gas and we know where a lot of it is," Mr. Althoff said. "We'll connect the dots and we'll support our buyers and we'll support our partners."

One of the top natural gas analysts in North America, Ziff Energy's senior vice-president of gas services Bill Gwozd said exposure to the Montney will be a long-term boon for the Jordan Cove LNG project.

"I've always suggested that Canada should annex Oregon because we view those Oregon projects tapping into the western Canadian sedimentary basin," Mr. Gwozd said.

He said that the Montney was one of four natural gas plays that would provide the majority of the growth of Western Canada's natural gas production in the coming years, and would be a key supplier of gas feedstock for the developing LNG industry.