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Enclosed herewith are the comments of The Dow Chemical Company on the NERA Economic Consulting (“NERA”) Report *Macroeconomic Impacts of Increased LNG Exports from the United States*.

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Before the
UNITED STATES DEPARTMENT OF ENERGY
OFFICE OF FOSSIL ENERGY

2012 LNG Export Study

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Request for Comments

COMMENTS OF THE DOW CHEMICAL COMPANY

January 24, 2013

I. INTRODUCTION

In accordance with the Department of Energy (“DOE”), Office of Fossil Energy’s (“OFE”) request for comments, The Dow Chemical Company (“Dow”) is pleased to present these comments on the NERA Economic Consulting (“NERA”) Report *Macroeconomic Impacts of Increased LNG Exports from the United States* (the “NERA Report” or the “Report”).¹ OFE has sought comments to help inform the U.S. government’s determination of the public interest in connection with requests for authorization to export LNG.

As a threshold matter, it is important to understand that even though the Report finds net economic benefits at the broadest economic level, these gains would be concentrated in the oil and gas industry sectors. All other sectors of the economy would, according to the Report, lose. The Report concludes that “[e]xpansion of LNG

¹ 2012 LNG Export Study, 77 Fed. Reg. 73,627 (Dec. 11, 2012).

exports has two major effects on income: it raises energy costs and, in the process, depresses both real wages and the return on capital in all other industries.”²

While this finding is striking, the NERA Report is, on the whole, inadequate for assessing the macroeconomic impacts of LNG. The Report is fundamentally flawed due to its top-down modeling approach, outdated assumptions and data, and the lack of a robust peer review. Furthermore, the authors failed to account for a variety of important economic issues in their modeling exercise, such as regional or sectoral job losses and gains, the potential for increased gas prices and price volatility, the impacts of tighter environmental regulations on hydraulic fracturing and water disposal, and the likelihood for higher greenhouse gas (“GHG”) emissions domestically and from the LNG value chain due to liquefaction, shipping, and regasification. Consequently, the NERA Report is not helpful in determining, and certainly should not be determinative of, the public interest with regard to increased LNG exports. More generally, the Report is not a reasonable basis for U.S. government policymaking or administrative action.

But it is not just the quantification of economic considerations that is inadequate. Even a sound macroeconomic assessment, important though it is, should be but one element of a public interest determination. The Report cannot and does not address, as a policy matter, the gross imbalances in harm and benefits that could inure from significantly higher LNG exports. In addition, as the Deputy Secretary of Energy has observed, a public interest evaluation needs to account for a variety of considerations, from environmental to international to energy security.

² NERA Report at 7.

Despite its failings, the NERA Report has stimulated sufficient public attention and deliberation that OFE could readily obtain the necessary input for appropriate economic modeling through public comments on the general topic of macroeconomic considerations. This could be done in the context of a focused, short term rulemaking. This is a matter of critical national significance. The importance and complexity of the issue requires a process that will allow for the reasoned consideration of myriad viewpoints on the question of whether additional exports of natural gas are in the public interest. For that reason, we see no adequate procedural alternative to a full administrative proceeding by OFE. Only through that process, including public hearings, can the government establish the appropriate criteria for making the statutorily required public interest determinations for LNG export authorizations.

II. DOW

Dow was founded in Michigan in 1897 and is one of the world's leading manufacturers of chemicals and plastics, supplying more than 5,000 products to customers in 160 countries, including hundreds of specialty chemicals, plastics, agricultural and pharmaceutical raw materials for products essential to life. About 25,000 of Dow's 52,000 employees are in the United States.

Dow is an energy intensive, trade exposed ("EITE") company. It uses energy resources, primarily natural gas and natural gas liquids ("NGL"), for energy and feedstocks to make products essential to the economy and quality of life. Energy is used to drive the chemical reactions necessary to turn feedstocks into useful products, many of which lead to net energy savings and lower carbon footprints.

Dow supports expanded trade and U.S. exports and has a long tradition of playing a constructive role in assisting with U.S. government evaluation of international energy and trade policy matters. Dow believes that with development and implementation of public interest criteria and metrics for LNG export applications, the system can achieve an appropriate balance of national interests. The goal should be to encompass the impact on the nation as a whole, from the American consumer to the various sectors of the economy and, at a minimum, to reflect income effects, job creation and value-added from production and investment.

III. EXECUTIVE SUMMARY

The NERA Report purports to be an assessment of the “potential macroeconomic impact” of LNG exports based on an “energy-economy model.” On further scrutiny, two conclusions stand out. First, a variety of flaws in the authors’ modeling approach make the NERA Report’s findings unsound and incomplete. Second, neither the NERA Report nor any other macroeconomic assessment of LNG exports can address the range of public policy issues that should be considered in deciding the public interest.

NERA Report Is Fundamentally Flawed and Incomplete

Macroeconomic modeling can be used for assessing economy-wide energy and environmental policies, such as GHG policies, that have significant impacts on every sector of the economy. However, for narrower assessments such as LNG exports, the tool can be too blunt if incorrectly applied with outdated assumptions and without proper peer review. This is the case with the NERA Report, which leaves it a profoundly flawed economic analysis. It grossly underestimates gas price increases, price volatility

and, in general, economic harm that could result from unchecked LNG exports. Some of the flaws in NERA's approach are summarized below.

Defects in Modeling of Demand

- The NERA modeling approach does not rest on valid projections of U.S. demand for natural gas. It is based on two-year old data (Annual Energy Outlook 2011), which do not account for scores of announced investment projects by energy-intensive industries that will require major volumes of natural gas. At minimum, NERA should have used the most up-to-date statistics, not only from EIA but also other public and subscription sources, and should have given consideration to the scores of industry investment announcements based on a presumption of a continued reasonable gas price.
- The Report fails to account for structural factors that would result in higher domestic gas prices. For example, the Report does not account for the impact of long-term "take or pay" commitments or oil-indexed contracts, which are common in international LNG contracts.
- The Report's underlying economic modeling relies on simplistic and flawed selection of demand elasticities. It uses the same elasticities to evaluate demand among all non-U.S. regions – an approach that cannot comport with reality.

Defects in Modeling of Supply

- The modeling approach does not account for the inability of U.S. supply to keep up with what would be skyrocketing export demand. The Report assumes relatively modest rates of gas production increases. In fact, unprecedented production increases would be required to meet the demand resulting from unchecked LNG exports if domestic natural gas demand were simultaneously to grow at all – which is very likely.
- The modeling approach does not address the possibility of new policy by federal and state agencies that could greatly hinder continued expansion of U.S. natural gas development utilizing hydraulic fracturing.

Defects in Modeling Price Effects

- The Report understates domestic gas price effects and fails to consider how increased LNG exports' true price impact affects industry and consumers.
- The NERA model by itself is incapable of assessing what would most probably be a spike in price volatility as a result of lifting constraints on LNG exports. Natural gas price volatility, and the increased uncertainty inherent in such

volatility, would have a wide-ranging, disproportionately adverse effect on development and capital investment among U.S. gas-consuming industries.

Defects in Modeling Industry Impact

- The NERA model represents the industrial sector as an average of five sub-sectors, which mutes the impacts of LNG exports on critical, high employment sub-sectors such as the chemical industry. The chemical industry relies chiefly on natural gas and NGLs for its energy and feedstock needs. In 2011, energy and feedstock represented 42 percent of Dow's costs.
- NERA's modeling approach fails to account for the importance of manufacturing to the U.S. economy and the harm that would result when LNG exports undermine the U.S. manufacturing sector. In particular, the Report fails to adequately address the value added by manufactured goods as compared to the once-through value of natural gas when burned. It also fails to account for the loss of new investments (currently \$95 billion announced) and the loss of new jobs (estimated at 5 million).

Other Modeling Defects

- The Report misapprehends the employment and trade-balance implications of higher LNG exports. The United States is enjoying an explosion in exports of energy-intensive manufactured goods, due largely to reasonable natural gas prices. Any reversal of that trend caused by higher natural gas prices would negate the balance-of-payments impact of higher gas exports.
- The Report wrongly assumes that foreign investment is playing and will play a minor role in the expansion of natural gas export infrastructure. In fact, quite the opposite is true.

Failure to Cover Other Relevant Economic Issues

- The NERA Report fails to address a number of important economic questions. NERA's brochure on its model confirms that not all results have been provided as part of its submission to OFE. More granular results on a regional and economic sector basis missing for each scenario include regional and sectoral analysis of:
 - Employment levels in "job-equivalents"
 - Employment income
 - Household income - demand and prices of fuel inputs and electricity
 - Welfare, GDP, investment, consumption, and output
 - GHG emissions.

In a recent letter, the Deputy Secretary of Energy confirmed that the U.S. government needs to evaluate issues like these as it determines whether increased LNG exports are in the public interest.

Dow urges that OFE ensure that the complete set of NERA's model results is released to the public.

Absence of Peer Review

- A peer review process was not completed on the NERA modeling approach and final results. While there is no government-wide rule for when and how to conduct peer reviews, there are established peer review processes within DOE for scientific programs. DOE should have applied a rigorous peer review of the Report as it could have a significant impact on energy policy decisions.

Given these flaws, U.S. officials should not consider basing policy judgments on the NERA Report. And the defects are so far-reaching that, by and large, they cannot be corrected through modeling adjustments.

Economic Modeling Cannot Provide Answers to All Relevant Policy Issues

As the government pursues LNG-export public interest analyses, it should also be borne in mind that neither the NERA Report nor any other economic analysis can be decisive on the range of factors that should bear on decision-making regarding U.S. LNG export policy. These include, for example,

- competitiveness of U.S. industries in international markets in light of, among other things, reciprocity among national policies or the lack thereof
- energy security and the broader national security
- U.S. foreign policy and other international considerations, including consistency with U.S. obligations under international trade rules
- environmental issues that are not susceptible to economic modeling.

Again, the Deputy Secretary of Energy has confirmed that public interest assessments should be broadly inclusive in this way.

By its terms, the NERA Report seeks merely to complete what is essentially an accounting exercise about whether, at the highest level of aggregation, benefits from increased LNG exports outweigh adverse implications. But U.S. policymaking has never been and should not be driven by this type of macroeconomic cost-benefit assessment. If it were, we would simply turn all policymaking over to a committee of economists.

Public interest determinations regarding LNG exports require a thoughtful, holistic assessment of LNG export policy informed by better economic analysis and other input from the broad spectrum of U.S. stakeholders. This will facilitate informed evaluations of implications for the full profile of U.S. values.

IV. COMMENTS

The NERA Report acknowledges that expanding LNG exports would “raise[] energy costs” and “depress[] both real wages and the return on capital in all other industries.”³

The authors contend that benefits to the oil and gas industry and its owners would offset these losses. While this alleged offset is inaccurate, one should not lose sight of what the Report itself is conveying. While the Report’s price increase projections are significantly understated, even those understated price increases would have far-reaching negative impacts on the health and competitiveness of U.S. manufacturing and agriculture. The United States is enjoying an explosion in exports of energy-intensive manufactured goods, due largely to reasonable natural gas prices. Deceleration of growth in exports of manufactured goods caused by higher natural gas prices would overwhelm the balance-of-payments impact of higher gas exports.

³ NERA Report at 7.

Beyond that, and as detailed below:

- The NERA Report’s modeling is flawed and overly narrow. The actual modeling is defective in many ways, and it fails to account for a variety of important economic issues that the underlying model can be used to address.
- Neither the NERA Report nor any economic modeling can cover the range of policy issues that need to be evaluated for public interest determinations on LNG exports.

A. The NERA Report Is Fundamentally Flawed and Incomplete

1. Defects in Modeling Demand

- a. Using Out-of-Date Data, Report Underestimates U.S. Demand for Natural Gas

The NERA Report bases its analysis on the U.S. Energy Information Administration (“EIA”) Annual Energy Outlook from 2011 (“AEO 2011”).⁴ These two year-old data were not accurate when compiled in 2011, and they do not account at all for presently planned and underway capacity expansions in the manufacturing, transportation and power sectors.

The NERA Report highlights its reliance on these out-of-date statistics:

NERA’s modeling of shifts in natural gas price, production, and demand are built off an attempt to replicate EIA’s price path. This was an important step to ensure that the NERA model output was consistent with the EIA’s model. Of particular importance was the ability to replicate EIA’s natural gas prices as closely as possible since it is a key driver of macroeconomic impacts.⁵

⁴ EIA, *2011 Annual Energy Outlook* (Dec. 16, 2010).

⁵ NERA Report at 200.

As a threshold point, it is questionable for NERA to assume the same price path as EIA rather than modeling the price path itself. Moreover, far from strengthening the report, NERA's replication of AEO 2011's price path ensures that its modeling will not be useful and makes any related conclusions inaccurate and unreliable. Since the data omit a recent upsurge in investment, they lead NERA to produce modeling results that significantly underestimate demand for natural gas and hide actual anticipated domestic U.S. price consequences from LNG exports.

Further, since completion of AEO 2011, there has been a manufacturing renaissance with announcements of approximately 100 capital investments in manufacturing representing some \$95 billion in new spending and millions of jobs driven largely by the supply and price outlook for natural gas.⁶ These investments will add about 5 million new jobs and 6 bcf/d of industrial gas demand by 2020.⁷ That is nearly a 30 percent increase in industrial demand relative to 2009, the baseline year for AEO 2011, and is simply unaccounted for in the NERA Report.

NERA, at page 60 of the Report, describes the manufacturing sector as a "modest consumer of natural gas." To the contrary, industry is the largest total natural gas consumer in the United States. Through direct use of natural gas, and indirect use of natural gas through the electric power sector, industry consumes 40 percent of the nation's natural gas.

⁶ See Exhibit 1.

⁷ "Rising U.S. Exports—Plus Reshoring—could help create up to 5 million jobs by 2020," BCG, Press Release, <http://www.bcg.com/media/pressreleasedetails.aspx?id=tcm:12-116389>, Sept. 21, 2012 (last visited Jan 14, 2013).

Considering these new investments, as well as economic growth and production increases in all of industry, U.S. industrial gas demand could grow by as much as 11 bcf/d by 2035. This is more than double the demand predicted by the AEO 2011's high EUR case, which itself includes significantly higher demand than the reference case.

Industrial demand is not the only area where the demand data relied upon for the NERA Report are flawed. AEO 2011 sees a very modest level of increased demand for natural gas in transportation, shifting from 0.1 to 0.2 bcf/d over the 2013 – 2020 timeframe. Yet data from Wood Mackenzie, CERA and others indicate a potential increase from 0.2 to 1.5 bcf/d.⁸ This is due largely to market-driven increases in fleet vehicles converting to LNG and compressed natural gas to replace other conventional fuels like diesel and gasoline.

With regard to power, AEO 2011 projected a decrease in power sector natural gas demand through the end of the decade. This view does not reflect even today's reality, let alone projections going forward, as more power plants rely on natural gas rather than coal as prices are low, coal regulations are increasing, and older coal plants are facing retirement. Data show a 14 percent increase in power sector demand growth by 2020, ultimately resulting in 24.7 bcf/d of power sector demand.⁹ There are three main potential and powerful energy policy drivers in the future demand equation: (1) carbon policy, (2) renewables policy, and (3) nuclear policy. Each of these areas carries with it significant implications for increasing natural gas demand.

⁸ Dow analysis of internal data and proprietary data obtained from Wood Mackenzie and CERA.

⁹ Dow analysis of internal data and proprietary data obtained from Wood Mackenzie and CERA.

Such a significant under-recognition of natural gas demand establishes that AEO 2011 is not a credible source for natural gas demand.

b. Report Fails to Account for Structural Factors That Would Increase LNG Exports

The Report assumes that once the gap between U.S. and foreign gas prices (stated on a delivered, apples-to-apples basis) is closed, exports of LNG from the United States will cease. The Report further assumes that if a foreign country gains access to cheaper gas resources – from third country exports, domestic gas projects, or both – the foreign country will cease purchases of U.S.-sourced LNG. These assumptions fail to account for the standard use of long-term (e.g., twenty-year) “take or pay” contracts that inhibit the free flow of price signals in the gas market and lead to shipments beyond the expected margin.

Furthermore, the NERA Report calculates the price received for exports by assuming they will be based on Henry Hub pricing with an added tolling fee plus a 15 percent markup. While this may be true of some contracts, it certainly does not reflect the reality of how most LNG export projects will be structured. A Chevron company executive recently and candidly noted that linking LNG pricing to U.S. benchmark gas prices is not an economical strategy for most export projects.¹⁰ Additionally, subsidized public lending entities would be expected to promote investments in infrastructure to facilitate trade in U.S. LNG.

¹⁰ “Chevron: Most LNG Prices to Remain Linked to Oil,” *The Wall Street Journal*, U.S. Edition, Dec. 5, 2012, available at <http://online.wsj.com/article/SB10001424127887324640104578160712548841932.html>.

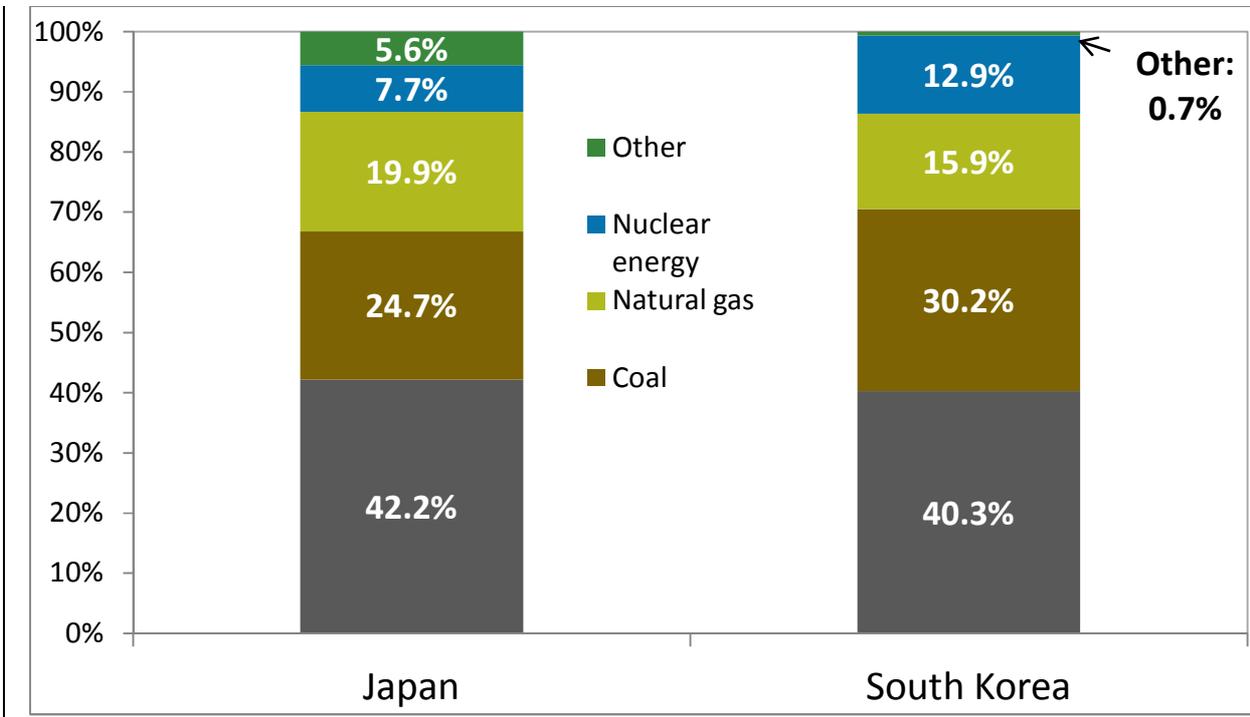
c. Report Uses Flawed Demand Elasticities

The Report employs the same demand elasticity for all regions outside of the United States.¹¹ It is unrealistic to assume that the price elasticity of demand for imported natural gas will be the same in gas-poor countries that rely heavily on gas to meet their domestic energy needs (e.g., Japan and Korea) and gas-rich countries (e.g., Russia and Canada). Gas-poor countries are desperate for imported energy because they either have little-to-no reserves or the reserves they have are not economically supported for development at current and expected gas prices. For example, Japan and Korea consumed 4.53 TCF of LNG or 47 percent of the world's LNG supply in 2010.¹² It is expected that the demand for LNG from Japan and Korea, along with other gas-poor countries will be extremely strong in the future. The chart below shows how much gas Japan and Korea consumed in 2010 as part of their total energy consumption. This chart does not include the increased Japanese gas consumption due to the Fukushima Daiichi nuclear disaster. Moving significantly away from gas in the near-to-medium term would be almost impossible for these countries, suggesting even lower elasticities than what NERA uses.

¹¹ NERA Report at 91.

¹² NERA Report, Figure 10 at 19.

Japan and Korea Energy Consumption by Fuel Type - 2010



Source: World Bank.

The same may not be true for Russia and Canada, which have extensive domestic reserves of natural gas. Use of the same, flawed demand elasticity for all foreign countries undoubtedly affected the modeling results and almost certainly led to a significant underestimation of demand for exported natural gas moving forward.

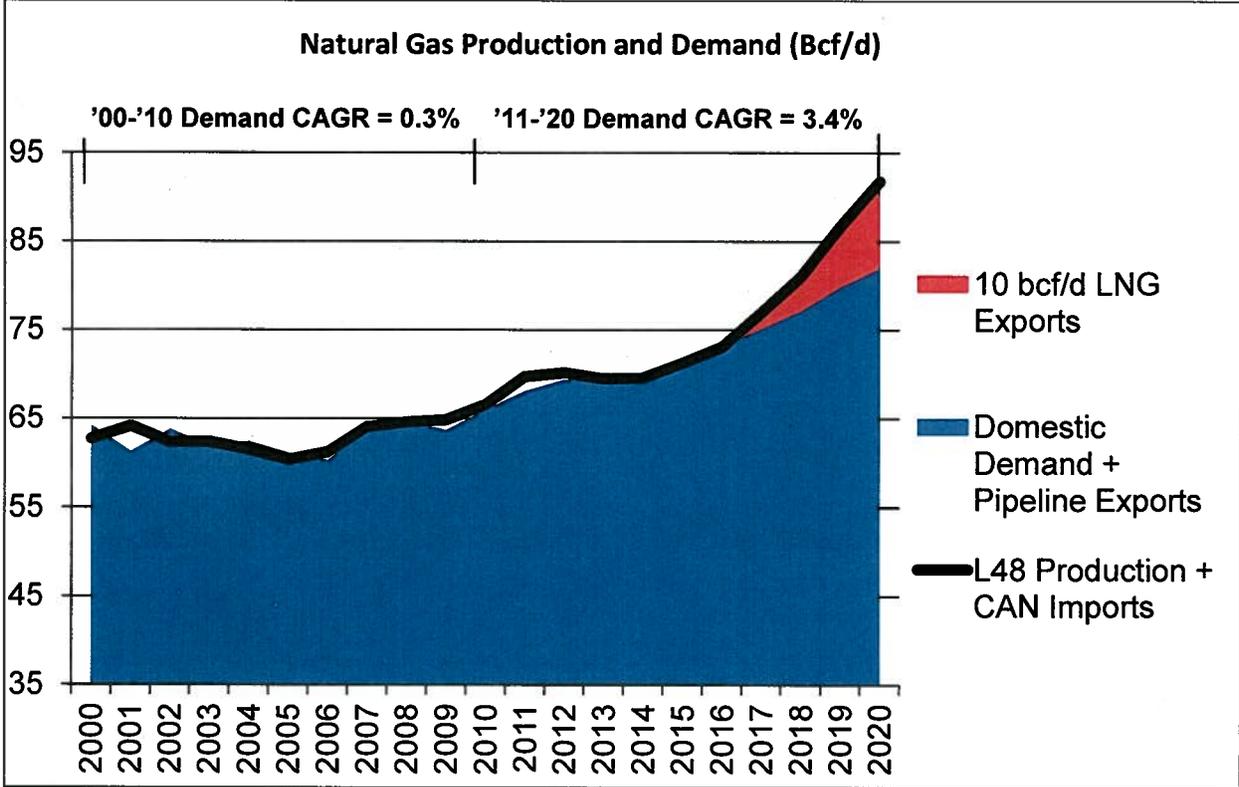
2. Defects in Modeling Supply

- a. Domestic Gas Production Would Be Unable to Keep Up with Demand Required To Satisfy Unlimited LNG Exports

In stark contrast to its gross underestimation of natural gas demand, NERA tends to have an unduly optimistic and sanguine view regarding future natural gas supply increases. In fact, increasing the supply of natural gas involves lags and uncertainties similar to those on the demand side. Supply will not automatically emerge to meet demand. Critically, one-third of new shale gas production will be required simply to

replace the decline in conventional gas production, which clearly exacerbates the supply challenge.

NERA’s model indicates that 10 bcf/d in LNG exports would bring about inevitable, major gas price increases. In doing so, the model posits that rising exports will be offset by declining domestic demand for natural gas, such that overall demand for U.S. natural gas will go up by less than exports. It is wholly unrealistic to posit that domestic demand for natural gas is going to decline in the coming years, unless natural gas prices spike upwards. The underlying domestic demand for natural gas likely will increase significantly in the coming years, so higher domestic demand will supplement higher export demand. It is unproven and unlikely that natural gas production can consistently keep up with such increases in demand.



Source: Dow analysis of internal data and proprietary data obtained from Wood Mackenzie and CERA.

An export level of 10 bcf/d by 2020 would require U.S. production to increase to 86 bcf/d by 2020 (a 36 percent increase in production relative to 2011). It is unprecedented for U.S. production to grow by over 20 bcf/d in such a truncated time period. In fact, the last time 20 bcf/d was added it took the oil and gas industry 20 years to do so. Further, the bulk of demand growth will occur in 2017–2020, when production would have to be capable of sustaining an unprecedented growth rate year-to-year.

A level of production growth at that level presents two main problems for the economy. First, given the labor and capital requirements of meeting such an aggressive level of production growth, resources will necessarily be pulled out of the industrial and other sectors. There would need to be rapid deployment of new drilling rigs, increased steel pipe manufacturing and an expanded work force throughout the value chain to be able to service such unprecedented growth in production. With an already well-documented skills shortage in the labor market, basic supply and demand economics will prevail and drive labor prices higher, which would in turn have a chilling impact on investment in the manufacturing sector.

Second, because demand from new industrial projects and LNG facilities would come online in the 2017-2018 time frame, prices would rise dramatically followed by a potential crash due to stalled industrial growth. At this level of production growth in such a short time, it seems very unlikely that the supply response will be high and fast enough to accommodate demand growth without price spikes, particularly given the timing of when industrial projects and LNG facilities will come online. To accommodate these price shocks, the natural gas market will inevitably experience demand destruction to regain balance. That is, industrial demand for natural gas will be

destroyed by price spikes. Such destruction of industrial natural gas demand will be felt most significantly in the EITE industries due to their gas price sensitivity, while LNG exports will continue relatively unabated due to the prevalence of long term, high-priced take or pay contracts. Thus, price spikes caused by supply shortages will both drive industry away from natural gas and hurt the profitability of the U.S. industrial base, especially that portion of the industrial base accounted for by EITE industries. Similar supply shortages drove up price levels and price volatility from 2000 through 2009 with the attendant loss of jobs in the industrial sector. In fact, if industry believes this is the likely outcome, then the entire \$95 billion in new capital investments will be put at risk of being cancelled or delayed, along with all the attendant job creation. Clearly this will also be felt across the power sector and residential heating where prices will rise dramatically for consumers as oil-indexed global LNG prices drive U.S. domestic gas prices and the domestic manufacturing industry foregoes capital investment and job creation due to demand destruction.

A secondary challenge will also develop, and that is the capacity and locations of pipelines. Even if the natural gas industry can produce the gas at reasonable prices in the quantity desired, pipelines will need to be built to accommodate the new volumes. Such rapid expansion of pipeline infrastructure is hardly a certainty. In 2012, the Midwest Independent Transmission System Operator, Inc. (“MISO”) concluded that, even today, 65 percent of the pipelines in the MISO region do not have adequate capacity going forward over the next five-to-six years.¹³ The supply of natural gas

¹³ MISO, *Overview for Gas-Electric Infrastructure Workshop: 2011-2030*, MISO Region (Sept. 2012).

underground is one thing, but until the gas is removed from the ground and transported to where it is needed the supply is only theoretical, not actual.

b. Report Does Not Address Supply Security for the United States

The NERA Report does consider a low LNG production scenario. However it does **not** consider significant policy changes that could impact the level of natural gas production even further. For example, tax credits for energy production, which are highly valued by domestic oil and gas producers, continue to be targeted in federal budget negotiations and could expire under some tax reform scenarios. According to Wood Mackenzie, it is estimated that the expiration or elimination of those tax credits could result in a 5 percent decline in natural gas production and the loss of nearly 60,000 bpd of oil production.¹⁴ Thus, tax policy changes behavior and should have been considered in the Report when modeling various scenarios.

In addition, the NERA Report appears to lack full consideration of the implications of future regulation of hydraulic fracturing, the process by which abundant shale gas resources have come into production in recent years. While the NERA Report does recognize the uncertainty of domestic supply, cost and regulation, it chooses the Low Shale EUR case as its low gas production scenario, which assumes lower recovery per well, **but not** extra cost due to regulation. There are currently a number of relevant regulatory proposals under consideration by several federal agencies, including the Department of the Interior and the Environmental Protection Agency, as well as by various state legislative and regulatory authorities. While effective regulation is

¹⁴ Wood Macenzie, *Evaluation of Proposed Tax Changes on the U.S. Oil and Gas Industry* 13 (Aug. 2010).

necessary to ensure that the environment will be protected and to assure the public that the natural gas industry adheres to a set of acceptable performance standards, it cannot simply be assumed that additional regulation will not curtail production beyond the levels already considered in the “low production scenario” and result in higher prices.

The prospect of new stringent environmental regulations can threaten future growth in production. Hydraulic fracturing has been used for over 60 years in the oil and natural gas industry. The process employs materials under high pressure to fracture the geologic formations holding in natural gas or crude oil, allowing it to flow to the surface. Without this technology, sources of oil and gas, like shale, would not be possible. Along with the significant success of hydraulic fracturing and the development of new vast sources of natural gas and crude oil has come an onslaught by activist environmental groups intent on curbing or even stopping this activity. In nearly all shale producing areas, activists have protested fracturing technology as allegedly being dangerous to the environment and in particular drinking water. Though most states have not changed policy in response to these groups, there is a continued threat of intervention that could hinder continued development activities.

Efforts of these groups could result in policy changes that substantially impede growth of U.S. natural gas production. Dow believes that hydraulic fracturing has a good overall track record and can be done safely. Dow also believes that the practice requires appropriate regulation to assure safe and environmentally sustainable production.

The nation's energy history is replete with instances where government policy constrained supply while driving up demand. It is more than plausible to believe that

this condition could recur. In short, there are many uncertainties on the supply side of the equation.

3. Defects in Modeling Price Effects

- a. Report Understates Price Effects and Does Not Convey True Price to Industry and Consumers of Increased LNG Exports

First, the NERA Report provides on page 2 that:

Natural gas price increases at the time LNG exports could begin range from zero to \$0.33 (2010\$/mcf). The largest price increases that would be observed after 5 more years of potentially growing exports could range from \$0.22 to \$1.11 (2010\$/mcf).

Even if these estimated price increases were reasonably accurate, which is not the case for reasons explained elsewhere in these comments, NERA is indicating that price increases of up to 8 percent would occur immediately, and, after 5 years, percentage increases would range up to 28.1 percent. Dow respectfully submits that an average wellhead price increase of 28.1 percent or \$1.11/mcf would likely result in lost manufacturing jobs and cause significant damage to the U.S. economy.

Second, the NERA Report underestimates the impact of unconstrained LNG exports that would further increase costs to consumers:

As seen in Figure 6, in no case does the U.S. wellhead price increase by more than \$1.09/mcf **due to market-determined levels of exports**. Even in cases in which no limits were placed on exports, **competition between the US and competing suppliers of LNG exports and buyer resistance limits increases in both U.S. LNG exports and U.S. natural gas prices**. (Emphasis added.)¹⁵

NERA's assertion that prices will never increase by more than \$1.11/mcf is founded on the proposition that natural gas exports – even unconstrained exports – will never rise

¹⁵ NERA Report at 10-11.

higher than 6.72 tcf/year or roughly 18.5 bcf/day by 2025. However, as of January 11, 2013 the U.S. government had already approved approximately 28 bcf/day in natural gas exports to FTA countries¹⁶ and is considering authorizing far higher volumes of exports. NERA fails to consider what would happen if natural gas exports reached levels at or near the authorized levels under a “no constraint” scenario. If exports were to reach such levels, then domestic natural gas prices undoubtedly would spike upwards, and any valid economic model would demonstrate as much.

Third, the NERA Report observes at page 2 that:

U.S. natural gas prices increase when the U.S. exports LNG. But the global market limits how high U.S. natural gas prices can rise under pressure of LNG exports because importers will not purchase U.S. exports if U.S. wellhead price rises above the cost of competing supplies.

While this arbitrage phenomenon makes general sense in most competitive markets, it does not make much sense in the global LNG market given the likely broad use of long-term “take-or-pay” contracts in that market. At no point in the NERA Report is this alleged effect illustrated in context with the other substantial cost and pricing data presented.

The NERA Report notes at page 12 that:

In none of the scenarios analyzed in this study do U.S. wellhead prices become linked to oil prices in the sense of rising to oil price parity, even if the U.S. is exporting to regions where natural gas prices are linked to oil. The reason is that costs of liquefaction, transportation, and regasification keep U.S. prices well below those in importing regions.

NERA posits that natural gas prices will never reach parity with crude oil prices. That may or may not be true. However, even if that is true, it certainly does not mean that

¹⁶ Department of Energy, *Applications Received by DOE/FE to Export Domestically Produced LNG from the Lower 48 States.* <http://www.fossil.energy.gov/programs/gasregulation/index.html>

natural gas prices could not rise markedly as a result of LNG exports. To the contrary, the current gap between the domestic LNG price and the crude oil price is so large that gas prices could rise tremendously without reaching parity.

As indicated in the table below, even if NERA is correct about crude parity, the price netback from Japan-Korea could prompt natural gas prices to double as a result of unconstrained exports of LNG.

Analysis of LNG Netback to U.S. from Various Markets – 2015
(US\$ per mmbtu)

	A	B	C = A - B	D	E = C/D
	Market Price	LNG Costs Adders ¹⁷	Net Back	U.S. Wellhead	Wellhead Premium
Europe	10.97	6.3	4.67	3.83	122%
China-India	14.36	8.39	5.97	3.83	156%
Japan-Korea	15.8	7.14	8.66	3.83	226%

Source: NERA Report.

Thus, based on the high netback values, it seems clear that there is a very strong economic incentive for U.S. exports to these mostly non-FTA markets, and so long as U.S. exporters can achieve these results and DOE authorizations, U.S. gas will flow out of U.S. markets and U.S. domestic gas prices will spike upwards.

Moreover, given that many of these contracts will involve non-U.S. parties, profits are likely to flow outside of the U.S. tax base as well.

¹⁷ These adders include very significant regasification and pipeline from regasification to city gate costs, ranging from \$1.40 to 2.38 per mmbtu. If the exported LNG is priced as delivered to the import terminal, the margins, and economic incentives could be even higher than shown here.

In short, there is no basis to conclude that U.S. LNG exports will be severely constrained by competition among suppliers or buyer resistance. To the contrary, the economic realities are that U.S. LNG exporters have sufficient cost headroom to make significant profits even with higher U.S. domestic gas prices, likely even moving domestic U.S. gas prices much closer to world oil-indexed levels.

There is also evidence of large, non-U.S. gas exporters attempting to create a cartel to further control natural gas exports and pricing, the consequences of which are also not anticipated or modeled by NERA but could have the same effect of dramatically raising U.S. natural gas prices.¹⁸ That is, as the supply of LNG in the world export market is constrained by a cartel, demand for U.S. LNG would spike even higher than would otherwise be the case, leading to even higher volumes of U.S. exports and even greater increases in U.S. natural gas prices.

b. Report Disregards Exacerbated Gas Price Volatility

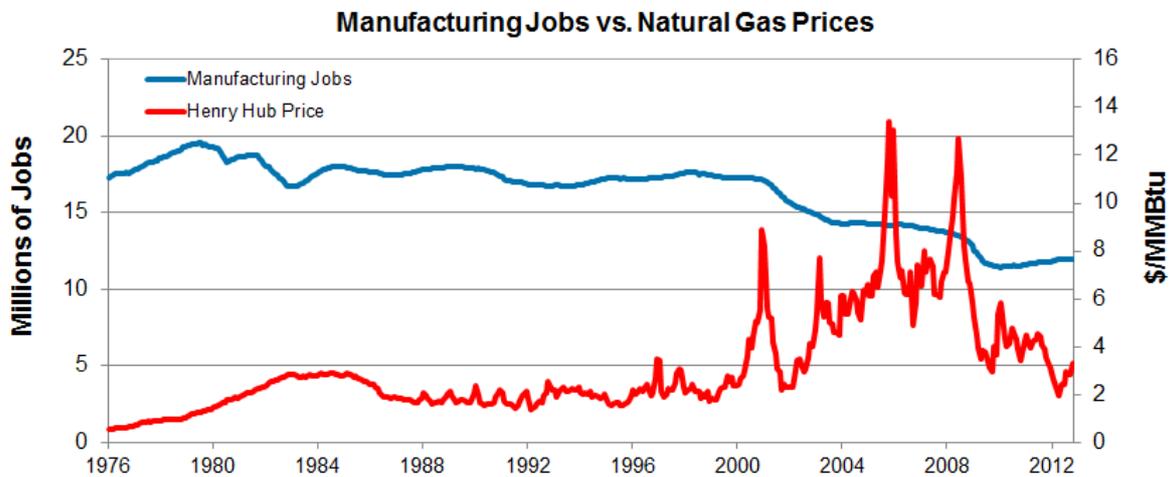
The NERA Report disregards injurious gas-price volatility that would result from unlimited LNG exports. According to NERA, the model it used “is a model of long run economic growth such that in any given year, prices, employment, or economic activity might fluctuate above or below projected levels.”¹⁹

Apart from sustained higher prices, erratic pricing of inputs results in uncertainty, suspended investment plans and, ultimately, diminished growth and reduced employment among industries that rely on those inputs. History shows that high

¹⁸ “Natural gas exporting group seeks coordination over pricing,” *Bloomberg*, Dec. 22, 2012, available at <http://www.bloomberg.com/news/2012-12-22/natural-gas-exporting-group-seeks-coordination-over-pricing.html>.

¹⁹ NERA Report at 5.

volatility in U.S. natural gas prices can impact employment in manufacturing. Since 2000, higher gas prices and high volatility coincided with an industrial gas demand decrease of 24 percent or 5.4 bcf/d. This resulted in a loss of approximately 6 million U.S. manufacturing jobs from 2000-2009, or roughly one third of all manufacturing jobs. However, since January 2010 the manufacturing sector has added over 500,000 jobs. Billions of dollars worth of newly announced investments spurred by lower gas prices are expected to create millions more new jobs.



Source: Energy Information Administration; Bureau of Labor Statistics.

Looking forward, large increases in gas demand from LNG exports will tighten the U.S. supply-demand balance significantly. In natural gas markets, as in other energy commodity markets, periods of tight supply-demand balance are typically correlated with high price volatility. Higher volatility in natural gas prices is detrimental to both industrial and residential consumers, and these risks cannot be completely hedged away without costs.

In addition, price volatility is frequently driven by expectations rather than current reality. And expectations of increased demand often outpace expectations of increased supply

since supply takes years to come online. Gas traders routinely count increased demand as soon as the contracts are signed, even though the contracts may run for years and the actual level of demand will not increase significantly until several years down the line. That is, expectations run far ahead of reality on the demand side. In contrast, traders and other market participants recognize that it will take years for new production and pipelines to come online and supply to increase. So, on the supply side, expectations and reality are more closely aligned. These dynamics exacerbate price volatility during inflection periods (i.e. periods of market change).

The NERA Report is acutely skeptical about demand increases (other than from exports) and profoundly optimistic about new supply (which seems to appear exactly when needed and in sufficient quantities and at low prices). Over the past decade when the natural gas market was in short supply market participants expected that the United States would need, at the margin, to buy LNG. The anticipated need for substantial import volumes drove the natural gas price up markedly. NERA ignores the impact of such a shortage mentality and the consequent price volatility. Natural gas volatility and attendant uncertainty would result in suspension or cancellation of major portions of the \$95 billion in new capital investment by energy-intensive industries.²⁰

Recent history has exhibited a “boom and bust” cycle of gas price volatility and similarly volatile LNG industry expansion and contraction. Generally, from 1990 to 2000, natural gas prices were low and not particularly volatile. Then, in the 2000 – 2009 period, as supply could not keep pace with demand there were ever increasing and highly volatile gas prices with feverish interest in importing LNG to address the supply-demand

²⁰ See, e.g., BIAC, *Thought Starter on Price Volatility in Energy Markets* (Jan. 2012).

imbalance. From 2009 to the present, with the supply influx of gas from shale, prices have been lower with less volatility, and a feverish rush to export LNG has arisen. The NERA Report would buttress and facilitate this rush to export by significantly underestimating domestic gas demand, finding abundant gas supplies from wherever, and simply missing the clear potential for one more “boom and bust” cycle of higher and more volatile domestic gas prices driven by oil-indexed global LNG pricing and domestic industrial demand destruction with seriously problematic employment and adverse domestic price consequences for residential heating and electricity consumers.

4. Defects in Modeling Industry Impact

a. Model Lacks Granularity and Fails to Address Industry-Specific Impacts

As evidenced by Figure 74 of the NERA Report, the Report aggregated sectors and did not perform industry-specific, granular analysis. Accordingly, NERA’s results are not industry-specific and fail to take account of volatilities and hardships experienced on an industry-specific level, some of which may be pronounced. It is unrealistic to posit, as NERA does, that the impact of expanded natural gas exports will be the same within the chemical, paper and plastic industries, respectively.

NERA used its proprietary energy-economy model for its study. The model is a computable general equilibrium (“CGE”) model that represents the economy through twelve sectors – eleven aggregated sectors and the electric sector, which is a detailed, bottom-up representation with considerable detail. The energy intensive sector (“EIS”) is one of the eleven aggregated sectors, which includes the following five industries according to NERA’s classification:

- Chemical manufacturing

- Paper and pulp manufacturing
- Glass manufacturing
- Cement manufacturing
- Primary metal manufacturing²¹

The NERA modeling approach is to bundle these five sectors into one sector and assume that average behavior is representative of all five industries. NERA mislabels Chemical manufacturing as NAICS code 326. NAICS code 326 actually refers to “Plastic and Rubber Products” while NAICS code 325 refers to “Chemical Products”. It is possible that NERA forgot to include chemical products in its EIS sector aggregation. If so, this would be another example of a fundamental flaw in NERA’s analysis that would further undermine its impact analysis of LNG exports on the chemical manufacturing industry.

By bundling these industries, NERA applies the same labor, capital, fuel, and other material inputs in the same way across industries. Such an aggregation mutes the true impact to the industries, especially the chemical products industry. The chemical products subsector varies significantly from the other four industries in terms of value added to the economy (GDP) and energy consumption by fuel source:

²¹ NERA Report at 64.

Bureau of Economic Analysis Industry	2011 Value Added (\$ Billion)	2011 Employment	Total Energy Consumption (Millions of Barrels of Oil Equivalent)				
			Natural Gas	LPG and NGL	Net Electricity	Coal	Other
Chemical products	253	785,000	10,130	13,360	3,000	1,060	2,320
Fabricated metal products	122	1,347,000	1,390	30	830	0	50
Plastics and rubber products	69	635,000	740	30	1,060	N/A	130
Paper products	53	388,000	2,750	30	1,430	1,280	8,160
Nonmetallic mineral products ²²	33	364,000	2,670	30	850	1,860	1,060

Source: Bureau of Economic Analysis, *Value Added by Industry, Gross Output by Industry, Intermediate Inputs by Industry, the Components of Value Added by Industry, and Employment by Industry 2011*; EIA 2006 *Manufacturing Energy Consumption Survey* ((2010 Survey Results Not Yet Available), rounded to the nearest 10).

In addition, the chemical manufacturing industry is composed of dozens of different business models with varying inputs and outputs. These outputs have different price points and thus different value added to the economy. Shoe horning the chemical industry into an aggregated EIS is not appropriate for studying the impact of LNG exports on the economy.

b. Report Fails to Account for Importance of Manufacturing and Harm to Manufacturing If LNG Exports Increase Domestic Natural Gas Prices

The NERA Report demonstrates virtually no understanding of industrial gas usage in a competitive cost environment and inexplicably fails to address at all the value added by manufactured goods versus the once-through value of natural gas when burned. The negative impacts of unreasonable levels of LNG exports on the manufacturing sector,

²² Includes glass and cement manufacturing.

and by extension, the U.S. economy, are far worse than the Report anticipates. Using gas to make value-added products creates greater benefits, including ripple effects, for the U.S. economy than simply exporting raw BTUs. Moreover, the Report's analysis of global LNG pricing grossly underestimates U.S. incentives for LNG exports.

The Report reaches the misguided conclusion that there is little evidence that EITE industries are high value-added industries. The Report's reliance on this inaccurate understanding is another factor that independently undermines its credibility. NERA defines high value added industries to be those with high ratios of wages and profits to revenues.²³ In 2011, the chemical industry and the plastic and rubber industry both had higher value added ratios (i.e. higher ratios of wages and profits to revenues) than did manufacturing as a whole.²⁴ In addition, in 2011 the chemical industry had 46 percent more value added than did the oil and gas industry. Accordingly, NERA is incorrect to posit that EITE industries are not high value added industries.

The chemical industry alone is indicative. Industries accounting for more than 96 percent of all manufactured output utilize chemical industry products.²⁵ Unfortunately, it appears that the NERA model fails to account for how natural gas pricing impacts the wider economy, given that the Report states on page 70 that "it was not possible to model impacts on each of the potentially affected sectors."

Additionally, the NERA Report leans heavily on a study by a 2007 Interagency Task Force convened during the Waxman-Markey legislative debate to classify EITE

²³ NERA Report at 68-69.

²⁴ Bureau of Economic Analysis, *Gross Domestic Product by Industry Data*, http://www.bea.gov/industry/gdpbyind_data.htm (last visited January 15, 2013).

²⁵ Bureau of Economic Analysis, *Benchmark Input-Output Data, 2002 Standard Mark and Use Data at the Sector Level*, http://www.bea.gov/industry/io_benchmark.htm (last visited January 16, 2013).

industries. The NERA Report uses this study to define a slice of the economy that will be negatively impacted by LNG exports, which equated to 780,000 workers as of 2009. More importantly, the findings of the Task Force also led Congress to conclude that it was unacceptable to raise energy prices on energy intensive manufacturers because of the adverse employment implications across the economy. While the NERA Report borrows heavily from those parts of the Waxman-Markey congressional debate that could support LNG exports, predictions of adverse employment impacts from the congressional process are absent from the Report.

Both the current NERA model and report overstate the positive economic outcomes for the U.S. economy while dramatically underestimating the negative outcomes, leading to a flawed risk/benefit outcome and related conclusions.

5. Other Modeling Defects

a. Report Understates Employment and Trade Balance Impact of Higher Natural Gas Exports

The economic model employed by NERA assumes full employment and full labor fungibility/mobility across sectors.²⁶ These assumptions are unrealistic, especially given the current state of the U.S. economy. NERA necessarily understates the economic dislocations and unemployment associated with increased natural gas exports.

EITE industries that will be significantly harmed by the higher natural gas prices associated with increased natural gas exports employ far more people than does the oil and gas industry, which is likely to benefit from such exports. In 2011, total employment in the oil and gas industry was 171,000, while the chemical industry employed 785,000

²⁶ NERA Study at 110.

people, the plastic and rubber industry employed 635,000 people and the paper industry employed 388,000 people.²⁷

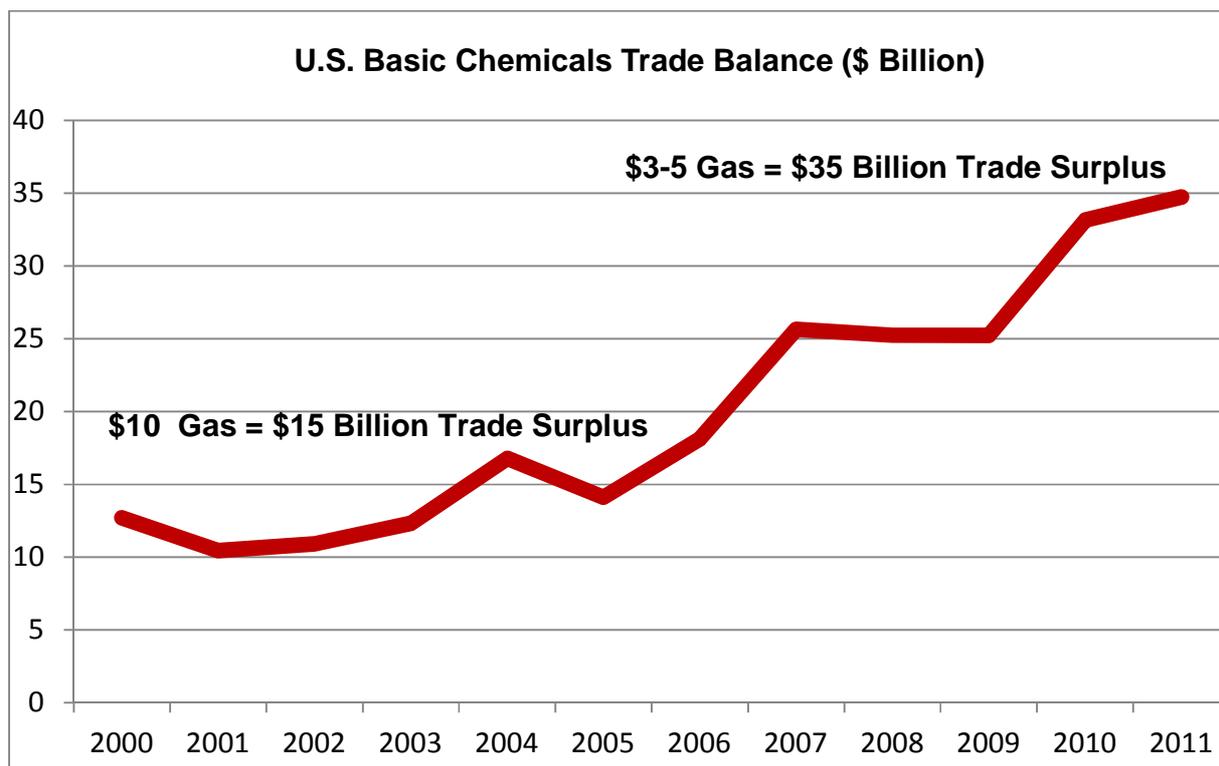
In addition, NERA ignores the impact on the overall U.S. trade balance associated with the increase in natural gas exports it models. NERA estimates that natural gas exports will bring in up to \$25 billion in additional U.S. export revenue by 2020.²⁸ Insofar as increased natural gas prices will adversely impact the international competitiveness of not only EITE industries but also the rest of the industrial and agricultural sectors, the overall level of exports outside of the natural gas sector is likely to drop. Even a modest percentage drop in those exports would overwhelm any increase in natural gas exports. Indeed, given that total U.S. exports outside of the oil and gas sector are in excess of a trillion dollars a year, it is quite plausible that the loss in exports by the agricultural and industrial sectors as a result of increased natural gas exports would be well in excess of \$30 billion by 2020. Accordingly, recent improvements in the U.S. trade balance and desired future improvements in that balance would be significantly undercut by a pronounced increase in natural gas exports.

The United States is enjoying an explosion in exports of energy-intensive manufactured goods, due largely to reasonable natural gas prices.

As indicated in the chart below, the U.S. trade surplus in Basic Chemicals has grown from roughly \$15 billion to roughly \$35 billion as natural gas prices have dropped.

²⁷Bureau of Economic Analysis, *Gross Domestic Product by Industry Data*, http://www.bea.gov/industry/gdpbyind_data.htm (last visited Jan. 15, 2013).

²⁸ NERA Report at 179 to 199.



Source: American Chemistry Council, Guide to the Business of Chemistry – 2012.

In addition, if a significant portion of the \$95 billion in capital investment by EITE industries discussed above were delayed or cancelled as a result of increased natural gas prices and price volatility, there would be a larger negative effect on exports from value-added manufacturing industries.

- b. Report Wrongly Assumes that Foreign Direct Investment Will Not Play a Major Role in Expansion of Natural Gas Export Infrastructure

The NERA Report assumes that all investment in natural gas production as well as liquefaction facilities will come strictly from U.S. entities, and it notes at page 211 that “macroeconomic effects could be different if these facilities and activities were financed by foreign direct investment.” However, a number of foreign entities are already

investing in natural gas production today, particularly on the gas exploration side.²⁹ China's CNOOC, France's Total, and Australia's BHP are just a few examples of foreign companies taking multi-billion dollar stakes in U.S. shale plays.³⁰ Thus, NERA's assumption of limited foreign direct investment is incorrect and, by NERA's own admission, renders the results of the Report flawed. Moreover, large investments in U.S. LNG export infrastructure by foreign interests will take profits outside the United States.

Furthermore, foreign direct investment in the natural gas sector by certain Asian countries (China in particular) may well be strategic, and could evidence an attempt to lock up supplies of natural gas for those energy-starved Asian markets.³¹ Such strategic investments could result in exports that are not tied to microeconomic considerations of the sort referenced by NERA, but rather to strategic economic considerations tied to the well-being of the foreign investor's home market.

Finally, in addition to losing the tax base that would have come from additional manufacturing and value add in the United States, large overseas investments in U.S. LNG exports from companies and import/export banks will take profits outside the United States, further shifting the risk/reward balance against LNG exports if they came at the expense of domestic manufacturing.

²⁹ See Exhibit 2

³⁰ See Exhibit 2.

³¹ See, e.g., *China's Global Quest for Resources and Implications for the United States*, Testimony of Dr. Mikkal Herberg (Research Director, Asian Energy Security Program The National Bureau of Asian Research) before the U.S.-China Economic and Security Review Commission (Jan. 26, 2012); Stanley Reed, "Chinese Oil Executive learning from Experience," *The New York Times* Nov. 12, 2012, available at <http://www.nytimes.com/2012/11/13/business/global/chinese-oil-executive-learning-from-experience.html>.

c. Model Benefits are Concentrated and Overstated

Natural gas impacts the entire economy, from electricity to vehicles to consumer products, and lower natural gas prices have already had a positive impact on the U.S. economy. From lower costs for raw materials and feedstocks for manufacturers to reduced energy bills for consumers, abundant, affordable natural gas has been a critical factor in the economic recovery that is underway. Unfortunately, the NERA Report's conclusions raise a number of concerns related specifically to the impacts of LNG exports across the whole of the economy and on consumers.

To quote from page 7 of the Report:

Expansion of LNG exports has two major effects on income: it raises energy costs and, in the process, depresses both real wages and the return on capital in all other industries, but it also creates two additional sources of income. First, additional income comes in the form of higher export revenues and wealth transfers from incremental LNG exports at higher prices paid by overseas purchasers. Second, U.S. households also benefit from higher natural gas resource income or rents.

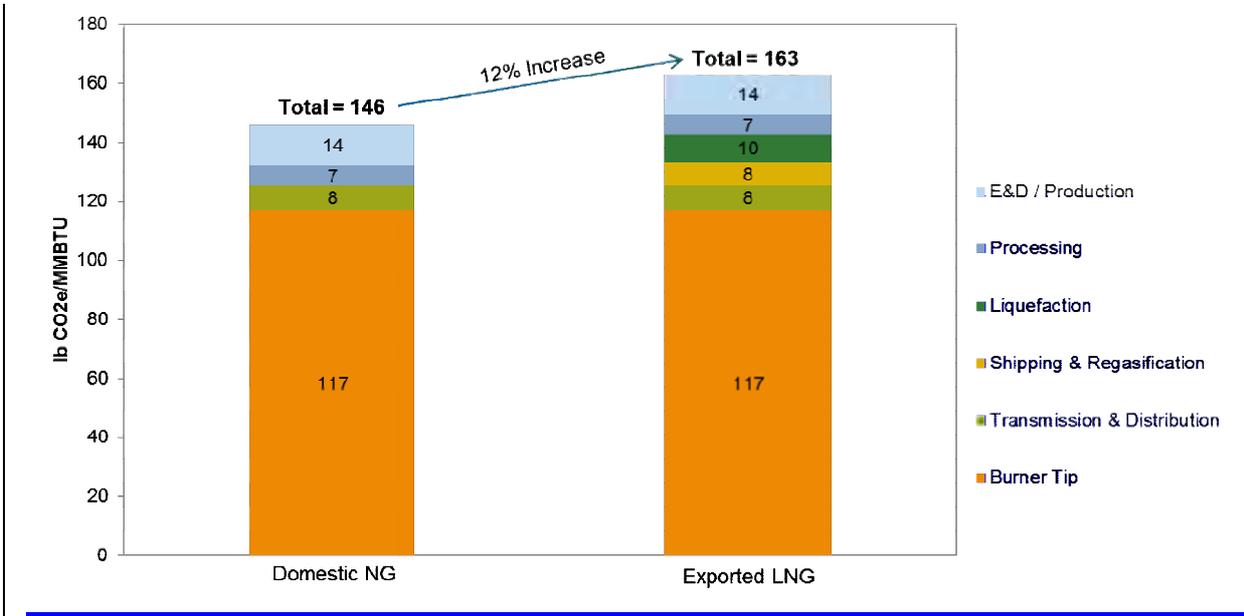
More specifically, in terms of the beneficiaries under each export scenario, the NERA Report provides that income from LNG exports will inure to companies involved in natural gas production and LNG operations, that consumers will benefit as their wealth increases through stock ownership and increases in retirement wealth (e.g., pensions) as those companies increase in value, and that these incomes will offset the higher costs associated with higher energy prices. Unfortunately, this wealth increase is not even predicted to be broad-based. It would be concentrated among those few who own stock in or work for gas production and LNG companies, while the broader population would be negatively impacted by higher energy costs. Indeed, Figure 4 at page 9 of the NERA Report specifies that, excepting gas and to some very limited extent oil, **all other**

industries will see real wages and investments decline. Indeed, the NERA Report's section heading "Some Groups and Industries Will Experience Negative Effects of LNG Exports" is affirmatively misleading, as the NERA Report's own results indicate that virtually all groups and industries will experience harm as a result of increased LNG exports.

Figures 144 through 155 of the NERA Report provide the detailed modeling results found by NERA. Those figures indicate that increased natural gas exports would result in lower total demand for natural gas within the United States, and lower demand for natural gas in every sector of the United States. In agriculture and industry, such decreased demand for natural gas could occur for one or both of two reasons: the usage of natural gas per unit of production within each sector declines and the total production within each sector declines. NERA provides no evidence that increased exports of natural gas would reduce the natural gas intensity of the U.S. economy – i.e., the amount of natural gas needed to produce a unit of output – and there is no independent reason to believe that this would be the case. Moreover, if such a decline in natural gas intensity resulted from a shift to more use of coal, then there would be severe implications for the carbon intensity and CO₂ emissions of U.S. production. Moreover, the life-cycle emissions of LNG exports sent from the United States across the world are higher than domestically consumed gas (see Figure below), so claims that such exports would lower worldwide CO₂ emissions may not be true.

Indeed, U.S. GHG emissions likely will rise if LNG exports spike because higher prices for U.S. natural gas will lessen fuel switching from coal to natural gas in the power sector, thereby increasing GHG emissions above the level that would otherwise occur.

Life-Cycle Emissions Comparison of Domestic Natural Gas vs. LNG Combusted



Source: ICF International; Charles River Associates.

As to consumers, on page 8 the NERA Report provides that “households with income solely from wages or transfers, in particular, will not participate in these benefits.” In other words, benefits will be quite regressive as higher prices of natural gas will raise energy bills which will disproportionately and negatively impact lower-income households and those supported by “wage earners,” which is most of the population. A 2012 study found that lower-income households, which represent close to a quarter of all U.S. households, pay over 20 percent of their after-tax income for energy.³² More than half of the homes in the United States use natural gas for heating, and many states in the Northeast are continuing to switch from fuel oil to natural gas for home heating, not to

³² American Coalition for Clean Coal Electricity, *Energy Cost Impacts on American Families 2001-2012* (Feb. 2012).

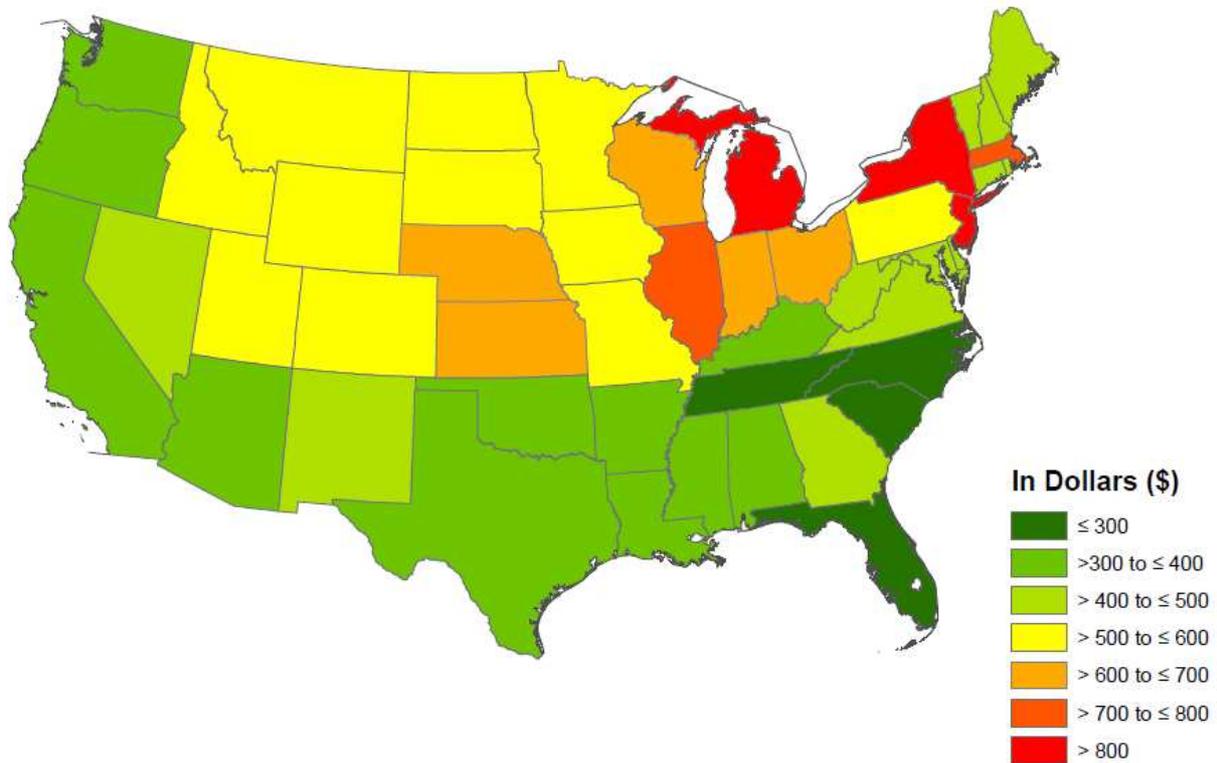
mention that seniors on fixed-incomes are particularly vulnerable to energy price increases and that electric price increases caused by higher natural gas fuel costs affect everyone. In addition, natural gas provides roughly 30 percent of the electricity generated and used in this country.³³

Natural gas is also a major household expenditure, primarily for home heating. To put the impact of LNG export-driven price increases in further perspective, we examined the additional natural gas costs that households would face under one of NERA's unchecked export scenarios.³⁴ As the figure below indicates, we found a wide disparity in costs on a state-by-state basis. For example, New York, New Jersey, and Upper Michigan residents would pay \$800 more per year in 2025, while residents of Tennessee, Kentucky, South Carolina, and Florida would experience less than a \$300 per year increase in their annual natural gas bills in 2025. These figures do not reflect higher costs of electric heating that would result from higher gas prices in an unchecked LNG export scenario. As more and more Americans switch from more expensive fuel oil to low-cost gas for home heating, unchecked LNG exports would result in something of a bait and switch, locking many Americans into higher-than-expected utility bills far into the future.

³³ EIA, *Electric Power Monthly*, Data for Oct. 2012, released Dec. 21, 2012, http://www.eia.gov/electricity/month/epm_table?grapher.cfm?t=epmt_1_01 (last visited Jan. 21, 2013).

³⁴ USREF_SD_NC scenario, which stands for reference case gas prices with an international supply/demand shock and unconstrained LNG exports.

Increased Household Natural Spending in 2025 by State in an Unconstrained Export Scenario³⁵



Further, while the Report acknowledges that EITE industries will be harmed by LNG exports, it is not at all clear that the planned capital investments associated with building LNG capacity will be offset by the capital that will not be invested by manufacturers if natural gas prices rise again to unaffordable levels. Given the \$95 billion of investments predicated on affordable natural gas that has been announced to date, analysis is

³⁵ Costs were calculated by taking the 2025 price differential between NERA's USREF_SD_NC scenario and its Reference Gas Price Scenario and multiplying by the state-level gas consumption from EIA's 2009 Residential Energy Consumption Survey.

needed of the opportunity cost related to employment and GDP if these investments do not go forward due to increased costs.

6. Failure to Cover Relevant Economic Issues

The NERA Report fails to address a number of important economic questions. NERA's on-line brochure regarding its model indicates that not all results have been provided as part of its submission to OFE.³⁶ More granular results on a national, regional and economic sector basis were not included, such as those for:

- Employment levels in “job-equivalents”
- Employment income
- Household income
- Demand and prices of fuel inputs and electricity
- Welfare, GDP, investment, consumption and output
- GHG emissions.

For a report that could have an enormous bearing on national policy, it is critical for all commenters to have the full set of modeling results for review. This would enable an open and transparent debate on the NERA modeling approach and analysis and possibly all future analyses that may arise. A fuller set of results would provide insights into the economic winners and losers of increased or unconstrained LNG exports on the American economy from a state, regional, household, and economic sector perspective. Dow urges that OFE ensure that the complete set of NERA's model results is released to the public.

³⁶ NERA, *The NewERA Model At A Glance*, http://www.nera.com/67_7607.htm (last visited Jan. 21, 2013).

7. Peer Review

The NERA Report was not peer reviewed. A peer review, where independent reviewers use specified evaluation criteria, may have caught a number of the flaws in the modeling approach selected and implemented. Peer reviews are a common process within both the U.S. government broadly³⁷ and DOE in particular.³⁸ OFE, which handles science-related matters, should have applied the peer review process to the NERA economic analysis given the weight that such a study could have on national policy decisions.

B. Economic Modeling Cannot Provide Answers to All Relevant Policy Issues

As the government pursues LNG-export public interest analyses, it should also be borne in mind that neither the NERA Report nor any other economic analysis can be decisive on the range of issues that should bear on decision-making regarding U.S. LNG export policy. Policy considerations and the public interest extend far beyond macroeconomics. Much more input, analysis and judgment is needed to come to grips

³⁷ The federal standard for peer review is set by the Office of Management and Budget's ("OMB") *Final Information Quality Bulletin for Peer Review*, published in 2004. That OMB Bulletin requires that certain information disseminated by federal agencies adhere to quality standards for peer review. The NERA Report should be considered "highly influential scientific information" subject to the highest standards outlined in the OMB Bulletin. <http://www.whitehouse.gov/sites/default/files/omb/memoranda/fy2005/m05-03.pdf>

³⁸ DOE has rigorous peer review and annual merit review ("AMR") process established for scientific programs. Examples of such peer review processes within DOE include the 2012 DOE Energy Storage Program Peer Review and Update Meeting (Sep. 2012), the Geothermal Technologies Program Peer Review Meeting (May 2012), the Hydrogen & Fuel Cells Program AMR (scheduled May 2013) and the Vehicle Technologies Program AMR (scheduled June 2014). *The Department of Energy's Peer Review Practices*, U.S. Department of Energy Office of Inspector General Office of Audit Services, Apr. 2008, at 1.

with all of the public policy and public interest considerations that bear upon LNG exports.

In a recent letter, the Deputy Secretary of Energy confirmed that the U.S. government intends to evaluate an expansive, comprehensive set of factors as it determines whether authorized LNG exports are in the public interest. In short, the government plans to examine any factor that bears on the public interest. In keeping with Deputy Secretary Poneman's letter, examples of factors for examination should include:

- competitiveness of U.S. industries in international markets in light of, among other things, reciprocity among national policies or the lack thereof
- energy security and the broader national security
- U.S. foreign policy and other international considerations, including consistency with U.S. obligations under international trade rules
- environmental issues that are not susceptible to economic modeling.

That factors like these do not necessarily lend themselves to economic or quantitative assessments does not mean that they should not play a role in public interest determinations.

By its terms, the NERA Report seeks merely to complete what is essentially an accounting exercise about whether, at the highest level of aggregation, benefits from increased LNG exports outweigh adverse implications. Even if aggregate benefits outweighed aggregate costs, this would still be only one of many considerations for a public interest assessment.

In this regard, U.S. policymaking has never been and should not be driven by this type of macroeconomic cost-benefit assessment. If it were, we would simply turn all policymaking over to a committee of economists.

Public interest determinations regarding LNG exports require a thoughtful, holistic assessment of LNG export policy informed by better economic analysis and other input from the broad spectrum of U.S. stakeholders. This will facilitate informed evaluations of implications for the full profile of U.S. values.

V. CONCLUSION

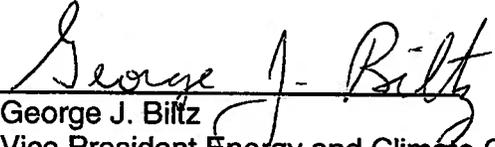
As shown above, the NERA Report is inadequate to serve as a basis for macroeconomic analysis needed for LNG export public interest determinations. At the same time, the NERA Report has stimulated sufficient public attention and deliberation that OFE could readily obtain the necessary input for appropriate economic modeling through public comments on the general topic of macroeconomic considerations. This could be done in the context of a focused, short term rulemaking.

This is a matter of critical national significance. The importance and complexity of the issue requires a process that will allow for the reasoned consideration of myriad viewpoints on the question of whether additional exports of natural gas are in the public interest. For that reason, we see no adequate procedural alternative to a full administrative proceeding by OFE. Only through that process, including public hearings, can the government establish the appropriate criteria for making the statutorily required public interest determinations for LNG export authorizations.

Dow supports expanded trade and U.S. exports and has a long tradition of playing a constructive role in assisting with U.S. government evaluation of international energy

and trade policy matters. Dow believes that with development and implementation of public interest criteria and metrics for LNG export applications, the system can achieve an appropriate balance of national interests. The goal should be to encompass the impact on the nation as a whole, from the American consumer to the various sectors of the economy and, at a minimum, to reflect income effects, job creation and value-added from production and investment.

Respectfully Submitted,


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Dated: 24 January 2012

Exhibit 1

Industry to Invest \$95 Billion In Manufacturing Renaissance

Total Industrial natural gas demand expected to grow by over 11bcf/day by 2035.

Newly announced investments below to exceed 6bcf/day.

Chemicals and Fertilizer				
	Company	Location	Date Online	Project Type
1	Dow	St. Charles, LA	2012	Ethylene Restart
2	Dow	Freeport, TX	2017	New Ethylene
3	Westlake	Lake Charles, LA	2012	Ethylene Expansion
4	Williams Olefins	Geismar, LA	2013	Ethylene Expansion
5	INEOS	Chocolate Bayou, TX	2013	Ethylene Debottleneck
6	LyondellBasell	Laporte, TX	2014	Ethylene Expansion
7	Westlake	Lake Charles, LA	2014	Ethylene Expansion
8	Aither Chemicals	WV or PA or OH	2016	New Ethylene
9	Exxon Mobil	Baytown, TX	2016	New Ethylene
10	Chevron Phillips	Baytown, TX	2017	New Ethylene
11	Formosa	Point Comfort, TX	2017	New Ethylene
12	Braskem	WV	2017	New Ethylene
13	Sasol	Lake Charles, LA	2018	New Ethylene
14	Shell	PA	2018	New Ethylene
15	Eastman	Longview, TX	2012	Ethylene/Polypropylene Expansion
16	Indorama	Under Consideration	2018	New Ethylene
17	LyondellBasell	Channleview, TX	NA	Ethylene Expansion
18	Sabic	Under Consideration	NA	New Ethylene
19	Occidental/Mexichem JV	Ingleside, TX	2016	New Ethylene
20	PTT Global Chemical	Under Consideration	NA	New Ethylene
21	Orascom Construction	Beaumont, TX	2011	Ammonia Restart
22	Orascom Construction	Beumont, TX	2012	Methanol Restart
23	Orascom Construction	Lee County, IA	2015	New Fertilizer
24	Potash Corp	Geismar, LA	2013	Ammonia Restart
25	Potash Corp	Augusta, GA	2013	Ammonia Expansion
26	Rentech Nitrogen	East Dubuque, IL	2013	Ammonia Expansion
27	Austin Powder	Mosheim, TN	2014	Ammonia Expansion
28	LyondellBasell	Channelview, TX	2014	Methanol Restart
29	Methanex	Geismar, LA	2015	Methanol Migration
30	CF Industries	Donaldsonville, LA	2015	Ammonia Expansion
31	CF Industries	Port Neal, IA	2015	Ammonia Expansion
32	Incitec Pivot	Under Consideration	NA	Ammonia Migration
33	Koch Fertilizer	Various	NA	Ammonia Expansion
34	LSB Industries	Pryor, OK	NA	Ammonia Restart
35	Dyno Nobel	Waggaman, LA	2015	New Ammonia
36	Celanese	Clear Lake, TX	2015	New Methanol
37	CHS Inc.	ND	2016	New Ammonia
38	Agrium	Under Consideration	2017	New Fertilizer
39	Dakota Gas	Beulah, ND	2016	New Fertilizer
40	ND Corn Growers Association	ND	NA	New Fertilizer
41	Ohio Valley Resources	Rockport, IN	2016	New Ammonia
42	Mosaic	St. James Parish, LA	2016	Ammonia Expansion
43	Dow	Freeport, TX	2015	New Propylene
44	Dow	Freeport, TX	2018	New Propylene
45	Eastman	Under Consideration	2015	New Propylene
46	Formosa	Point Comfort, LA	2016	New Propylene
47	LyondellBasell	Channelview, TX	2014	New Propylene
48	Mitsui	Ohio	2012	Propylene Expansion
49	Enterprise	Mont Belvieu, TX	2013	Propylene Expansion
50	Enterprise	Mont Belvieu, TX	2015	New Propylene
51	Exxon Mobil	Baytown, TX	2016	2 New Polyethylenes
52	Chevron Phillips	Old Ocean, TX	2017	2 New Polyethylenes
53	Eastman	Longview, TX	2012	EthylHexanol Expansion
54	Chevron Phillips	Baytown, TX	2014	New Hexene
55	Huntsman Chemical	McIntosh, AL	NA	Epoxy Expansion
56	INEOS	Gulf Coast	NA	Ethylene oxide
57	Kuraray	Pasadena, CA	2014	EVOH Expansion
58	Lanxness	Orange, TX	NA	Nd-PBR
59	Lubrizol	Deer Park, TX	2015	Plastic Resins

60	Honeywell Specialty materials	Mobile, AL	2012	Adsorbents; Catalysts
61	Westlake	Geismar, LA	2013	New Chlor-Alkali
62	Dow-Mitsui JV	Freeport, TX	2013	New Chlor Alkali
63	Molycorp	Mountain Pass, CA	NA	New Chlor-Alkali and rare earth metals mining
64	Formosa	Point Comfort, TX	2012	Chlorine/Caustic Soda
65	Formosa	Point Comfort, TX	2012	Ethylene Dichloride
66	Shintech	Plaquemine, LA	2012	VCM
67	Shintech	Plaquemine, LA	2012	Chlorine/Caustic Soda
68	Shintech	Plaquemine, LA	2012	PVC
69	Occidental	Jacksonville, TN	2013	Chlorine and Caustic Soda
70	Dow Agrosiences	Freeport, TX	NA	Herbicide
71	Mitsubishi Chemical Holdings Corp.	Freeport, TX	2017	Acrylic Resin
Steel & Aluminum				
72	Alcoa	Upper Burrell, PA	2012	Expansion
73	Alcoa	Lafayette, Indiana	2014	New
74	ArcelorMittal	Cleveland, OH	2012	Expansion
75	Carpenter Technology	Reading, PA	NA	Expansion
76	Carpenter Technology	Limestone County, AL	2013	New
77	Coilplus	North Carolina	2014	Expansion
78	Essar Steel	Nashwauk, MN	2015	New
79	Gerdau	St. Paul, MN	2014	New
80	Nucor	Blytheville, AK	2014	Expansion
81	Timken	Canton, OH	2014	Expansions
82	United States Steel	Lorain, OH	Completed 10/12	Expansions
83	United States Steel	Leipsic, OH	NA	New Steel
84	Metal-Matic	Middleton, OH	2012	Expansion
85	Vallourec and Mannesmann	Youngstown, OH	NA	New
86	Welspun	Little Rock, AK	NA	Expansion
87	Nucor	St. James Parish, LA	2013	New
88	Voestalpine	Under Consideration	NA	Iron
89	Borusan Mannesman	Under Consideration	2014	Steel Pipe
Tires				
90	Bridgestone	Aiken, SC	2014	New off-road radial tire / expansion passenger/light truck tire
91	Continental	Sumter, SC	2013 start / 2021 full capac.	Passenger and light truck tires
92	Michelin	Anderson, SC	2015	Earthmover tires (OTR)
93	Bridgestone	Bloomington, IL	2013	OTR Tires
Plastics				
94	M&G Group	Corpus Christi, TX	NA	New PET Plant
95	M&G Group	Corpus Christi, TX	NA	New PTA Plant
96	Huntington Foam	Greenville, MI	NA	Expansion
97	JM Eagle	Sunnyside, WA and Meadville, PA	NA	Polyethylene expansion
98	Springfield Plastics	Auburn, IL	2012	Polyethylene expansion
99	Kyowa America	Portland, TN	NA	Plastic Injection Molding
100	Lanxess	Gastonia, NC	Opened 9/12	Plastic
Natural Gas to Liquids				
101	Shell	LA or TX	NA	New
102	Sasol	LA	2018	New
103	Calumet Specialty Products Partners	Karns City, PA	2014	New
Glass				
104	Sage	Fairbault, MN	Opened 9/12	Dynamic; Electrochromic Glass
Transportation & Transportation Equipment				
105	Caterpillar	Athens, GA	NA	Tractors and Excavators
106	Airbus	Mobile, AL	2015	Airplanes
107	Honda Motor Co.	Anna, OH	2012	Advanced Transmission Components

Packaging				
108	Abbott Laboratories	Tipp City, OH	2013	Aseptic Packages
Current as of January 2013				

Exhibit 2

Foreign flurry

These are some of the billion-dollar-plus foreign investments in natural gas and oil shale plays. Permit applications to export liquefied natural gas from six American port terminals have been filed with the Department of Energy. Only one, at Sabine Pass, La., has been approved so far.

