UNITED STATES OF AMERICA
DEPARTMENT OF ENERGY
OFFICE OF FOSSIL ENERGY

IN THE MATTER OF	)	
	)	**FE DOCKET NO. 11-162-LNG**
Cameron LNG, LLC	)	
	)	

SIERRA CLUB'S MOTION TO INTERVENE, PROTEST, AND COMMENTS

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Table of Contents

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Cameron LNG, LLC ("Cameron") requests authorization to export up to 1.7 billion cubic feet per day (bcf/d) of natural gas as liquefied natural gas ("LNG") from an existing LNG import terminal in Cameron Parish, Louisiana. Department of Energy Office of Fossil Energy ("DOE/FE") cannot approve this proposal, because it is inconsistent with the public interest, and, in any event, Cameron has failed to provide the extensive environmental and economic analyses DOE/FE must consider.

Cameron argues that its proposed exports would be in the public interest in significant part because they would support increased domestic production of natural gas. Natural gas production, and shale gas production in particular, has significant environmental and economic impacts. Increasing production will increase these impacts, but Cameron does not even acknowledge, much less analyze, this issue. DOE/FE cannot authorize exports without fairly weighing these impacts. *See, e.g.*, *Udall v. Federal Power Comm'n*, 387 U.S. 428, 450 (1967). If DOE/FE weighed these impacts, it would have to conclude that the export project should not be authorized.

Because Sierra Club's many thousands of members have a direct interest in ensuring that domestic natural gas production is conducted safely, and that any exports do not adversely affect domestic consumers, Sierra Club therefore moves to intervene in this proceeding and protests Cameron's application.

I. Sierra Club Should be Granted Intervention

Sierra Club members live and work throughout the area that will be affected by the Cameron export plan, including in the regions near the Cameron facility and in regions near the pipelines and gas fields necessary to supply the plant. Sierra Club members everywhere will also be affected by increased gas prices which would be caused by the

plan. As of April 2012, Sierra Club had 2,899 members in Louisiana, 22,412 members in Texas and 608,095 members overall. Declaration of Yolanda Andersen at ¶ 7.[1] To protect its members' interests, Sierra Club therefore moves to intervene in this proceeding, pursuant to 10 C.F.R. § 590.303(b).

Consistent with that rule, Sierra Club states that its "asserted rights and interests," in this matter include, but are not limited to, its interests in the following:

- The economic impacts of any gas exports from the Cameron facility, whether individually or in concert with exports from other such facilities, including the consequences of price changes upon its members' finances, consumer behavior generally, and industrial and electrical generating facilities whose fuel choices may be affected by price changes. Sierra Club, in particular, works to reduce U.S. and global dependence on fossil fuels, including coal, gas, and oil, and to promote clean energy and efficiency in order to protect public health and the environment. To the extent changes in gas prices increase the use and production of fossil fuels, Sierra Club's interests in this proceeding are directly implicated.
- The environmental consequences of any gas exports from the Cameron facility, including emissions and other pollution associated with the gasification and liquefaction processes, environmental damage associated with pipeline, facility construction and operation, environmental impacts caused by shipping traffic, and the emissions associated with all phases of the process from production to combustion.
- The environmental and economic consequences of any expansion or change in natural gas production, especially in shale gas plays, as a result of increased gas exports, including damage to air, land, and water resources caused by the increasing development of these plays, and the public health risks caused by these harms.
- The environmental and economic consequences of the proposed Cameron export facilities themselves, whether considered by FERC or by DOE/FE, and the implications of such facility construction on the communities and ecosystems surrounding those facilities.
- The public disclosure, in National Environmental Protection Act and other documents, of all environmental, cultural, social, and economic consequences of Cameron proposal, and of all alternatives to that proposal.

Sierra Club has demonstrated the vitality of these interests in many ways. Sierra Club runs national advocacy and organizing campaigns dedicated to reducing American dependence on fossil fuels, including natural gas, and to protecting public health. These campaigns, including its Beyond Coal campaign, and its Natural Gas Reform campaign,

[1] Attached as Exhibit 1.

are dedicated towards promoting a swift transition away from fossil fuels and to reducing the impacts of any remaining natural gas extraction.

Finally, Sierra Club members will be directly affected by the export project in many ways. Members living in and around drilling sites in the Fayetteville, Eagle Ford, Haynesville, and other shale plays, will, according to Cameron, see drilling activity continue and intensify in part due to the export project. Gas production brings major industrial activity to previously rural sites, fragmenting formerly intact forests and fields, and can and has caused serious air and water pollution problems, loud noises, foul odors, and crushing traffic on small roads, among many other harms, discussed below. Members living near the facility itself will have to contend with the pollution and nuisance caused by export operations. And members throughout the country will be burdened by higher gas prices and increased climate change harms caused by project. In short, Sierra Club's members have a vital economic, aesthetic, spiritual, personal, and professional in the project.

Thus, although 10 C.F.R. § 590.303 states no particular standard for intervention, Sierra Club's interests in this proceeding would be sufficient to support intervention on any standard. Its motion must be granted.[2]

II. Service

Pursuant to 10 C.F.R. § 590.303(d), Sierra Club identifies the following persons for service of correspondence and communications regarding this application:

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III. Sierra Club Protests this Application Because It Is Not In the Public Interest and Is Not Supported by Adequate Environmental and Economic Analysis

DOE cannot approve this application for the reasons set out below. Sierra Club therefore files this protest pursuant to 10 C.F.R. § 590.304.

[2] If any other party opposes this motion, Sierra Club respectfully requests leave to reply. *Cf.* 10 C.F.R. §§ 590.302, 590.310 (allowing for procedural motions and briefing in these cases).

A. Legal Standard

DOE/FE has significant substantive and procedural obligations to fulfill before it can authorize Cameron's export proposal. We discuss some of those obligations created by the Natural Gas Act, the National Environmental Policy Act, the Endangered Species Act, and the National Historic Preservation Act here, before explaining why these obligations require DOE to deny export authorization in this case.

1. Natural Gas Act

Pursuant to the Natural Gas Act and subsequent delegation orders, DOE/FE must determine whether Cameron's proposal to export LNG to nations which have not signed an applicable free trade agreement ("FTA") with the United States is in the public interest.[3] As Cameron acknowledges, the public interest determination must include evaluation of environmental impacts.

Section 3 of the Act provides:

> [N]o person shall export any natural gas from the United States to a foreign country or import any natural gas from a foreign country without first having secured an order of [DOE/FE] authorizing it do so. [DOE/FE] shall issue such order upon application unless, after opportunity for hearing, it finds that the proposed exportation or importation will not be consistent with the public interest.

15 U.S.C. § 717b(a).[4]

Courts have interpreted this provision to include environmental effects. While the public interest inquiry is rooted in the Natural Gas Act's "fundamental purpose [of] assur[ing] the public a reliable supply of gas at reasonable prices," *United Gas Pipe Line Co v. McCombs*, 442 U.S. 529 (1979), the Natural Gas Act also grants DOE/FE "authority to consider conservation, environmental, and antitrust questions." *Nat'l Ass'n for the Advancement of Colored People v. Federal Power Commission*, 425 U.S. 662, 670 n.4

[3] The Natural Gas Act separately provides that DOE/FE must approve exports to nations which have signed a free trade agreement requiring national treatment for trade in natural gas "without modification or delay." 15 U.S.C. § 717b. DOE/FE has approved Cameron's application to export to FTA nations. *See* DOE/FE Order No. 3059 (Jan. 17, 2012).

[4] The statute vests authority in the "Federal Power Commission," which has been dissolved. DOE/FE has been delegated the former Federal Power Commission's authority to authorize natural gas exports. Department of Energy Redelegation Order No. 00-002.04E (Apr. 29, 2011). The Federal Energy Regulatory Commission has separately been delegated authority regarding the permitting, siting, construction and operation of export facilities. Department of Energy Delegation Order No. 00-004.00A. *See also* Executive Orders 12038 & 10485 (vesting any executive authority to allow construction of export facility in the Federal Power Commission and its successors).

(citing 15 U.S.C. § 17b as an example of a public interest provision); n.6 (explaining that the public interest includes environmental considerations) (1976). In interpreting an analogous public interest provision applicable to hydroelectric power and dams, the Court has explained that the public interest determination "can be made only after an exploration of all issues relevant to the 'public interest,' including future power demand and supply, alternate sources of power, the public interest in preserving reaches of wild rivers and wilderness areas, the preservation of anadromous fish for commercial and recreational purposes, and the protection of wildlife." *Udall v. Fed. Power Comm'n*, 387 U.S. 428, 450 (1967) (interpreting § 7(b) of the Federal Water Power Act of 1920, as amended by the Federal Power Act, 49 Stat. 842, 16 U.S.C. § 800(b)). Other courts have applied this *Udall* holding to the Natural Gas Act. *See, e.g.*, *N. Natural Gas Co. v. Fed. Power Comm'n*, 399 F.2d 953, 973 (D.C. Cir. 1968) (interpreting section 7 of the Natural Gas Act). [5]

DOE has similarly acknowledged the breadth of the public interest inquiry, including environmental concerns. Deputy Assistant Secretary Smith recently testified that "[a] wide range of criteria are considered as part of DOE's public interest review process, including… U.S. energy security… [i]mpact on the U.S. economy… [e]nvironmental considerations… [and] [o]ther issues raised by commenters and/or interveners deemed relevant to the proceeding." Testimony of Christopher Smith, Deputy Assistant Secretary of Oil and Gas Before the Senate Committee on Energy and Natural Resources (Nov. 8, 2011).[6] DOE rules require export applicants to provide information documenting "[t]he potential environmental impact of the project." 10 C.F.R. § 590.202(b)(7). In a previous LNG export proceeding, DOE determined that the public interest inquiry looks to "domestic need" as well as "other considerations," including the environment. *Phillips Alaska Natural Gas Corporation and Marathon Oil Company*, 2 FE ¶ 70,317, DOE FE Order No. 1473, *22 (April 2, 1999); *accord* Opinion and Order Conditionally Granting Long-Term Authorization to Export [LNG] from Sabine Pass LNG Terminal to Non-Free Trade Agreement Nations ("Sabine Pass"), DOE/FE Order 2961 at 29, 37, 40 (May 20, 2011) (acknowledging that the public interest inquiry extends beyond effects on domestic natural gas supplies and discussing greenhouse gas and other air emissions as aspects of the public interest). Finally, DOE has applied its "policy guidelines" regarding the public interest to focus review "on the domestic need for the natural gas proposed to be exports; whether the proposed exports pose a threat to the security of natural gas supplies, *and any other issue determined to be appropriate*." Sabine Pass at 29 (citing 49 Fed. Reg. 6,684 (Feb. 22, 1984)) (emphasis added).[7]

[5] Further support for the inclusion of environmental factors in the public interest analysis is provided by NEPA, which declares that all federal agencies must seek to protect the environment and avoid "undesirable and unintended consequences." 42 U.S.C. 4331(b)(3).

[6] Attached as Exhibit 2.

[7] Although germane here, these Policy Guidelines are merely guidelines: they "cannot create a norm binding the promulgating agency." *Panhandle Producers and Royalty Owners Ass'n v. Economic Regulatory Administration*, 822 F.2d 1105, 1110-1111 (D.C. Cir. 1987).

Finally, Cameron's application concedes that the public interest determination includes environmental impacts. In discussing the public interest, Cameron cites various purported environmental benefits, including effects on greenhouse gas emissions. Cameron Application at 27. Although Sierra Club disputes Cameron's environmental conclusions, we agree on the broader principle that environmental issues weigh on the public interest determination.

Although DOE/FE has adopted a presumption that LNG export applications are consistent with the public interest, this presumption is rebuttable and not determinative. The DC Circuit Court has explained to DOE/FE this presumption is "highly flexible, creating *only* rebuttable presumptions and leaving parties free to assert other factors." *Panhandle Producers and Royalty Owners Ass'n v. Economic Regulatory Administration*, 822 F.2d 1105, 1110-1111, 1113 (D.C. Cir. 1987) (emphasis added, internal quotation marks omitted). Put differently, although DOE/FE may "presume" that an application should be granted, this presumption is not determinative, and DOE/FE retains an independent duty to determine whether an application is, in fact, in the public interest. *See* 10 C.F.R. § 590.404.

2. National Environmental Policy Act

NEPA requires federal agencies to consider and disclose the "environmental impacts" of proposed agency actions. 42 U.S.C. § 4332(C)(i). This requirement is implemented via a set of procedures that "insure [sic] that environmental information is available to public officials and citizens *before* decisions are made and *before* actions are taken." 40 C.F.R. § 1500.1(b) (emphases added). Agencies must "carefully consider [ ] detailed information concerning significant environmental impacts" and NEPA "guarantees that the relevant information will be made available" to the public. *Dep't of Transp. v. Public Citizen*, 541 U.S. 752, 768 (2004) (quoting *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 349 (1989)). The Council on Environmental Quality ("CEQ") directs agencies to "integrate the NEPA process with other planning at the earliest possible time to insure that planning and decisions reflect environmental values." 40 C.F.R. § 1501.2. "It is DOE's policy to follow the letter and spirit of NEPA; comply fully with the [CEQ] Regulations and apply the NEPA review process early in the planning stages for DOE proposals." 10 C.F.R. § 1021.100. DOE has adopted CEQ's NEPA regulations in full. *Id.* § 1021.103. The NEPA rules apply to "any DOE action affecting the quality of the environment of the United States, its territories or possessions." *Id.* § 1021.102.

The NEPA procedures require the agency to prepare an Environmental Impact Statement ("EIS") where a proposed major federal action would "significantly affect[] the quality of the human environment." 42 U.S.C. § 4332(C). The "significance" of effects is determined by both the context and intensity of the proposed action. 40 C.F.R. § 1508.27. If there is a "substantial question" as to the severity of impacts, an EIS must

be prepared. *See Klamath Siskiyou Wildlands Center v. Boody*, 468 F.3d 549, 561-62 (9th Cir. 2006) (holding that the "substantial question" test sets a "low standard" for plaintiffs to meet). DOE has determined that "[a]pprovals or disapprovals of authorizations to import or export natural gas… involving major operational changes (such as a major increase in the quantity of liquefied natural gas imported or exported" will "normally require [an] EIS." 10 C.F.R. Part 1021, Appendix D, D9; *see also* 40 C.F.R. § 1501.4 (discussing considerations relevant to whether to prepare an EIS). If it not clear that a proposal will "significantly" affect the environment, the agency may prepare an "environmental assessment" ("EA") to determine whether an EIS is necessary. 40 C.F.R. § 1508.9.

An EIS must describe:

> i. the environmental impact of the proposed action,
>
> ii. any adverse environmental effects which cannot be avoided should the proposal be implemented,
>
> iii. alternatives to the proposed action,
>
> iv. the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and
>
> v. any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented.

42 U.S.C. § 4332(C). The alternatives analysis "is the heart of the environmental impact statement." 40 C.F.R. § 1502.14. Here, the proposed action is to export LNG from the Freeport facility; DOE/FE must consider alternatives to this action. DOE/FE must take care not to define the project purpose so narrowly as to prevent the consideration of a reasonable range of alternatives. *See, e.g.*, *Simmons v. U.S. Army Corps of Engineers*, 120 F.3d 664, 666 (7th Cir. 1997). If it did otherwise, it would lack "a clear basis for choice among options by the decisionmaker and the public." *See* 40 C.F.R. § 1502.14.

An EIS must also describe the direct and indirect effects, and cumulative impacts of, a proposed action. 40 C.F.R §§ 1502.16, 1508.7, 1508.8; *Northern Plains Resource Council v. Surface Transportation Board*, 668 F.3d 1067, 1081-82 (9th Cir. 2011). These terms are distinct from one another. Direct effects are "caused by the action and occur at the same time and place." 40 C.F.R. § 1508.8(a). Indirect effects are also "caused by the action" but:

> are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include

> growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effect on air and water and other natural systems, including ecosystems.

40 C.F.R. § 1508.8(b). Cumulative impacts, finally, are not causally related to the action. Instead, they are:

> the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

40 C.F.R. § 1508.7. The EIS must give each of these categories of effect fair emphasis.

Agencies may also prepare "programmatic" EISs, which address "a group of concerted actions to implement a specific policy or plan; [or] systematic and connected agency decisions allocating agency resources to implement a specific statutory program or executive directive." 40 C.F.R. § 1508.17(b)(3); *see also* 10 C.F.R. § 1021.330 (DOE regulations discussing this possibility. As we later discuss, such an EIS is appropriate here.

Finally, and critically, while an EIS is being prepared "DOE shall take no action concerning the proposal that is the subject of the EIS" until the EIS is complete and a formal Record of Decision has been issued. 10 C.F.R. § 1021.211. During this time, DOE may take no action which would tend to "limit the choice of reasonable alternatives," or "tend[] to determine subsequent development ." 40 C.F.R. § 1506.1.

The Natural Gas Act designated the old Federal Power Commission as the "lead agency" for NEPA purposes. 15 U.S.C. § 717n. FERC has since generally filled that role, preparing the NEPA documents for LNG export and import decisions, as it did in *Sabine Pass*. *See* 10 C.F.R. § 1021.342 (providing for interagency cooperation). Whether or not FERC takes a lead role, however, DOE's ultimate NEPA obligations are the same: It may not move forward until the full scope of the action *it* is considering – here the approval of LNG export – has been properly considered in a valid EIS. Thus DOE/FE cannot approve Cameron's project on the basis of an EIS, or other NEPA document, that considers only the impacts of facility siting which are in FERC's jurisdiction.

3. Endangered Species Act

Pursuant to the Endangered Species Act's (ESA) directive that all agencies "shall seek to conserve endangered species," 16 U.S.C. § 1531(c)(1), DOE/FE must ensure that its approval of the Cameron's project "is not likely to jeopardize the continued existence of any endangered species . . . or result in the destruction or adverse modification of [critical] habitat of such species." 16 U.S.C. § 1536(a)(2). "Each Federal agency shall review its actions at the earliest possible time to determine whether any action may affect listed species or critical habitat." 50 C.F.R. § 402.14(a); *see also* 16 U.S.C. § 1536(a)(2).

This determination must be wide-ranging, because Cameron export proposal will increase gas production activities nationwide. Thus, DOE/FE must consider both the effects of the project on the eight or more protected species at the plant site as well as the effects of increased gas production across the full region the proposal affects.[8]

To make this determination, DOE/FE should, first, conduct a biological assessment, including the "results of an on-site inspection of the area affected," "[t]he views of recognized experts on the species at issue," a review of relevant literature, "[a]n analysis of the effects of the action on the species and habitat, including consideration of cumulative effects, and the results of any related studies," and "[a]n analysis of alternate actions considered by the Federal agency for the proposed action." *See* 50 C.F.R. § 402.12(f). If that assessment determines that impacts are possible, DOE/FE must enter into formal consultation with the Fish and Wildlife Service and the National Marine and Fisheries Service, as appropriate, to avoid jeopardizing any endangered species or adversely modifying its habitat as a consequences of its approval of Cameron's proposal. 16 U.S.C. § 1536(a), (b).

4. National Historic Preservation Act

DOE/FE must also fulfill its obligations under the National Historic Preservation Act (NHPA) to "take into account the effect of the undertaking on any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register." 16 U.S.C. § 470f; *see also Pit River Tribe v. U.S. Forest Serv.*, 469 F.3d 768, 787 (9th Cir. 2006) (discussing the requirements of the NHPA). Because "the preservation of this irreplaceable heritage is in the public interest," 16 U.S.C. § 470(b)(4), it behooves DOE/FE to proceed with caution.

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[8] According to the Fish and Wildlife Service's *Information, Planning, and Conservation System* website, http://ecos.fws.gov/ipac, the Cameron terminal's location creates a risk of impacts to four endangered species (the West Indian manatee, hawksbill sea turtle, kemp's ridley sea turtle, and leatherback sea turtle), four threatened species (the piping plover, gulf sturgeon, green sea turtle, and loggerhead sea turtle), and one candidate species (sprague's pipit).

DOE/FE must, therefore, initiate the NHPA section 106 consultation and analysis process in order to "identify historic properties potentially affected by the undertaking, assess its effects and seek ways to avoid, minimize or mitigate any adverse effects on historic properties." 36 C.F.R. § 800.1(a). NHPA regulations make clear that the scope of a proper analysis is defined by the project's area of potential effects, *see* 36 C.F.R. § 800.4, which in turn is defined as "the geographic area . . . within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties," 36 C.F.R. § 800.16(d). This area is "influenced by the scale and nature of an undertaking," *Id.* The area of potential effects should sweep quite broadly here because, as in the ESA and NEPA contexts, the reach of Cameron's proposal extends to the entire area in which it will increase gas production. Thus, to approve Cameron's proposal, DOE/FE must first understand and mitigate its impacts on any historic properties which it may affect. *See also* DOE Policy P.141.1 (May 2001) (providing that DOE will fully comply with the NHPA and many other cultural resources preservation statutes).

The regulations governing this process provide that "[c]ertain individuals and organizations with a demonstrated interest in the undertaking may participate as consulting parties" either "due to the nature of their legal or economic relation to the undertaking or affected properties, or their concern with the undertaking's effects on historic properties." 36 C.F.R. § 800.2(c)(5). Sierra Club meets that test, because the Club and its members are interested in preserving intact historic landscapes, for their ecological and social value, and reside through the regions affected by the Cameron proposal. Its members have worked for years to protect and preserve the rich human and natural fabric of these regions, and would be harmed by any damage to those resources. Sierra Club must therefore be given consulting party status under the NHPA for this application.

B. The Cameron Project Is Inconsistent With The Public Interest

Cameron's proposal is inconsistent with the public interest because it will induce significant environmental and economic harm that outweighs the proposal's benefits. The proposal will induce extensive additional natural gas extraction, primarily from shale gas sources. This extra production will have significant air, water, and other environmental impacts that Cameron completely ignores. Cameron's assertions of environmental benefits, on the other hand, are based on gas life-cycle analyses severely out of step with all other assessments. On economic issues, Cameron overstates the economic benefits of increased shale gas production and understates export's impact on domestic gas prices. Increased prices will cause environmentally harmful increases in coal-fired electricity production, increased prices for domestic consumers, and harm to manufacturing industries and the jobs they support.

1. **DOE/FE Must Not Evaluate The Public Interest Until Pending DOE/FE Studies Are Complete**

As a threshold matter, DOE/FE should not evaluate the public interest until its pending systemic studies of LNG exports is complete and the public has had an opportunity to comment on this study. As part of this study, DOE/FE has commissioned two reports. First, DOE/FE requested that the Energy Information Administration ("EIA") analyze "the impacts of increased domestic natural gas demand, as exports." EIA, *Effect of Increased Natural Gas Exports on Domestic Energy Markets* ("*EIA Study*"), p.1 (Jan. 19, 2012).[9] This study predicts price increases from all gas export scenarios, economically impacting residential and industrial users and causing environmental harm by causing gas fired electricity generation to switch to coal power. *Id.* at 6. The EIA study did not, however, consider the macroeconomic impacts of these effects, such as effects on domestic manufacturing jobs. *Id.* at 3.

To fill this gap, DOE has commissioned a second study that will consider these impacts. DOE discussed this pending second study in response to an inquiry from Representative Edward J. Markey, Christopher Smith, DOE Deputy Assistant Secretary for Oil and Natural Gas, wrote in a letter dated February 24, 2012.[10] DOE further stated that it would not grant final authorization to any pending export application until review of these two studies was complete. *Id.*

DOE/FE must honor this commitment with respect to the Cameron application. Moreover, because the forthcoming study will inform DOE/FE's decision, DOE/FE should not take action on the Cameron application (including granting a conditional authorization) until the public has had an opportunity to comment on this fundamental and underlying study. Because the forthcoming study should address fundamental issues underlying the public interest analysis, any public interest analysis made pursuant to a conditional authorization would need to be wholly revisited once the study is released.

2. **The Project Will Have Significant Adverse Environmental Impacts Not Discussed in Cameron's Application**

Cameron's proposal would impose significant environmental costs. The proposed exports would lead to increased natural gas production, especially from unconventional resources such as shale, which will significantly harm air, water, and landscape impacts.

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[9] Attached as Exhibit 3.

[10] Democratic Staff, House Natural Resources Comm., *Drill Here, Sell There, Pay More: The Painful Price of Exporting Natural Gas* (2012) ("*Drill Here, Sell There, Pay More*"), (Appendix 1 at 3), available at http://democrats.naturalresources.house.gov/sites/democrats.naturalresources.house.gov/files/content/files/2012-03-01__RPT_NGReport.pdf, and attached as Exhibit 4.

The proposal would also lead to increased domestic gas prices, which will increase domestic coal use and consequent air and water pollution. Each of these environmental harms translates into economic damage. If pollution sickens people, or restricts their travel, economic productivity will suffer – as it will, more directly, if clean air and water and adequate waste disposal capacity are not available. Similarly, as landscapes are industrialized, tourism, agricultural, forestry, hunting and angling, and other place-dependent industries will suffer. Thus, DOE/FE must both consider these environmental impacts in and of themselves and monetize them to weigh them against other economic harms in the public interest analysis.

a. The Project Will Harm The Environment by Inducing Further Natural Gas Production, Especially Shale Gas Production

Natural gas production—from both conventional and unconventional sources—is a significant air pollution source, can disrupt ecosystems and watersheds, leads to industrialization of entire landscapes, and presents challenging waste disposal issues. These impacts were recently highlighted by a Subcommittee of the DOE's Secretary of Energy's Advisory Board, which identified "a real risk of serious environmental consequences" resulting from continued expansion of shale gas production. DOE, Secretary of Energy's Advisory Board, *Shale Gas Production Subcommittee Second 90-Day Report* (Nov. 18, 2011) at 10.[11] These risks are discussed in greater detail below. Although some states and federal agencies are taking steps to limit these harms, these limited efforts will not eliminate the environmental harms.

LNG exports will induce further gas production, primarily from shale gas. The *EIA Study* concluded that across all modeled export scenarios, "[n]atural gas markets in the United States [would] balance in response to increased natural gas exports largely through increased natural gas production." EIA *Study* at 6. EIA concluded that "On average, across all cases and export scenarios, the shares of the increase in total domestic production coming from shale gas, tight gas, [and] coalbed sources are 72 percent, 13 percent, [and] 8 percent," respectively. *Id.* at 11.

Indeed, Cameron's application is premised on inducement of further shale gas extraction. Cameron asserts that as early as 2020, increases in production will provide 1.17 bcf/d of the 1.9 bcf/d needed for the terminal (the 1.7 bcf/d needed for exports and the 0.2 bcf/d needed for on-site consumption). Cameron application, Appendix C, Black and Veatch Report at 8. Cameron's discussion of purported economic benefits rests largely on the jobs associated with natural gas production. Cameron Application at 23 ("An even greater number of jobs, and far greater overall economic benefits, will result from the exploration and production of the 1.9 Bcfd of gas required for the

[11] Attached as Exhibit 5. The Board's First 90-Day Report is attached as Exhibit 6.

Project."). Cameron notes the increasing role of shale gas production, and concludes that much of the gas for the project will come from shale gas sources. *Id.* at 9-10. Much of this gas will come from the Barnett, Haynesville, and Eagle Ford shales. *Id.* The predicted increase in production is not confined to these regions, however. Cameron notes that because of the project's proximity to major pipeline infrastructure, the project can tap into nationwide gas supplies. *Id.* at 11. Sierra Club agrees that export will induce additional gas extraction, especially shale gas extraction, although Sierra Club disagrees with Cameron's assertions regarding the benefits of this increase, as explained below.

Although Cameron's application is premised on an increase in natural gas extraction, and shale gas extraction in particular, Cameron has not even acknowledged the environmental consequences of such extraction.

i. Natural Gas Production is a Major Source of Air Pollution

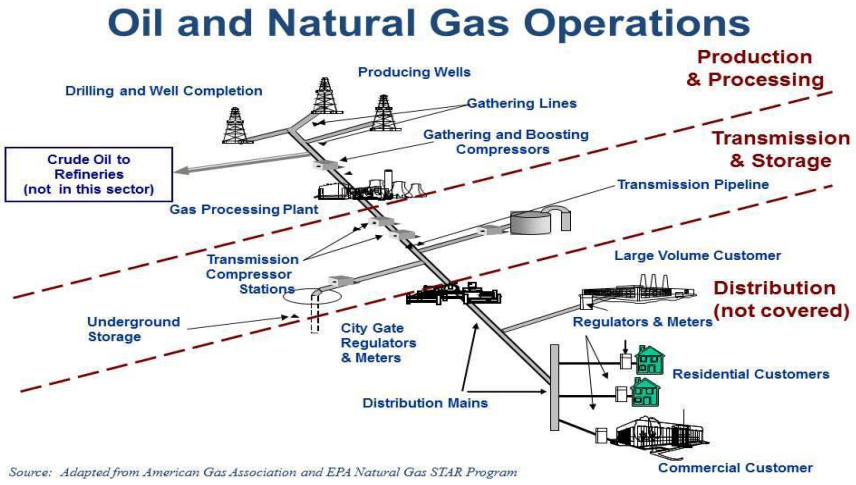
Below, we briefly describe some of the primary air pollution problems caused by the industry. These issues include direct emissions from production equipment and indirect emissions, caused by natural gas replacing cleaner energy sources. Although EPA addressed some of these problems with new air regulations finalized this month, these regulations will not fully address the problem. DOE/FE must therefore consider the air pollution impacts of increased natural gas production despite EPA's recent rulemaking.

1. Air Pollution Problems from Natural Gas

Oil and gas operations emit methane (CH_4), volatile organic compounds (VOCs), nitrogen oxides (NO_x), sulfur dioxide (SO_2), hydrogen sulfide (H_2S), and particulate matter (PM_{10} and $PM_{2.5}$). Oil and natural gas operations also emit listed hazardous air pollutants (HAPs) in significant quantities, and so contribute to cancer risks and other acute public health problems. Pollutants are emitted during all stages of natural gas development, including (1) oil and natural gas production, (2) natural gas processing, (3) natural gas transmission, and (4) natural gas distribution.[12] Within these development stages, the major sources of air pollution include wells, compressors, pipelines, pneumatic devices, dehydrators, storage tanks, pits and ponds, natural gas processing plants, and trucks and construction equipment.

[12] EPA, Oil and Natural Gas Sector: Standards of Performance for Crude Oil and Natural Gas Production, Transmission, and Distribution, Background Technical Support Document for the Proposed Rules ("TSD") at 2-4 (July 2011), attached as Exhibit 7.

Figure 1: The Oil and Natural Gas Sector



Methane: Methane is the dominant pollutant from the oil and gas sector. Emissions occur as result of intentional venting or unintentional leaks during drilling, production, processing, transmission and storage, and distribution. For example, methane is emitted when wells are completed and vented, as part of operation of pneumatic devices and compressors, and as a result of leaks (fugitive emissions) in pipelines, valves, and other equipment. Shale gas produces particularly high levels of methane: EPA recently estimated methane emissions from a conventional well completion at only 0.76 tons, while an unconventional well completion yielded 150.6 tons of methane.[13] EPA has identified natural gas systems as the "single largest contributor to United States anthropogenic methane emissions."[14] The industry is responsible for over 40% of total U.S. methane emissions.[15] Methane causes harm both because of its contributions to climate change and as an ozone precursor.

Beginning with climate change, methane is a potent greenhouse gas that contributes substantially to global climate change. Methane has at least 25 times the global warming potential of carbon dioxide over a 100 year time frame and at least 72 times the global warming potential of carbon dioxide over a 20-year time frame.[16] The oil and

[13] *Id.* at Table 4-6.
[14] 76 Fed. Reg. 52,738, 52,792 (Aug. 23, 2011) (EPA proposed air rules for oil and gas production sector), attached as Exhibit 8.
[15] *Id.* at 52,791–92.
[16] Intergovernmental Panel on Climate Change, *IPCC 2007—The Physical Science Basis*, Section 2.10.2, and *IPCC 2007- Summary for Policymakers*, attached as Exhibit 9. We note that these global warming potential

gas production industry's methane emissions amount to 5% of all carbon dioxide equivalent (CO_2e) emissions in the country.[17]

Because of methane's effects on climate, EPA has found that methane, along with five other well-mixed greenhouse gases, endangers public health and welfare within the meaning of the Clean Air Act.[18] The impacts of climate change caused by methane and other greenhouse gases include "increased air and ocean temperatures, changes in precipitation patterns, melting and thawing of global glaciers and ice, increasingly severe weather events, such as hurricanes of greater intensity and sea level rise."[19] A warming climate will also lead to loss of coastal land in densely populated areas, shrinking snowpack in Western states, increased wildfires, and reduced crop yields.[20] More frequent heat waves as a result of global warming have already affected public health, leading to premature deaths. And threats to public health are only expected to increase as global warming intensifies. For example, a warming climate will lead to increased incidence of respiratory and infectious disease, greater air and water pollution, increased malnutrition, and greater casualties from fire, storms, and floods.[21] Vulnerable populations—such as children, the elderly, and those with existing health problems—are the most at risk from these threats.

Methane also reacts in the atmosphere to form ozone.[22] As we discuss below, ozone is a major public health threat, linked to a wide range of maladies. Ozone can also damage vegetation, agricultural productivity, and cultural resources. Ozone is also a significant greenhouse gas in its own right, meaning that methane is doubly damaging to climate – first in its own right, and then as an ozone precursor.

Volatile Organic Compounds (VOCs) and NO_x: The gas industry is a major source of the ozone precursors VOCs and NO_x.[23] VOCs are emitted from well drilling and completions, compressors, pneumatic devices, storage tanks, processing plants, and fugitives from

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figures may be revised upward in the next IPCC report. A more recent study by Shindell *et al.* estimates methane's 100-year GWP at 33; this same source estimates methane's 20-year GWP at 105.

[17] 76 Fed. Reg. 52,738 at 52,791–92.

[18] EPA, Endangerment and Cause or Contribute Findings for Greenhouse Gases, 74 Fed. Reg. 66,496, 66,516 (Dec. 15, 2009) ("Endangerment Finding"), attached as Exhibit 10.

[19] 76 Fed. Reg. at 52,791-22 (citing U.S. EPA, 2011 U.S. GREENHOUSE GAS INVENTORY REPORT EXECUTIVE SUMMARY (2011), http://www.epa.gov/climateexchange/emissions/downloads11/US-GHGInventory-2011-ExecutiveSummary.pdf) attached as Exhibit 11).

[20] *Id.* at 66,532–33.

[21] EPA, *Climate Change, Health and Environmental Effects*, *available at* http://epa.gov/climatechange/effects/health.html, and attached as Exhibit 12.

[22] 76 Fed. Reg. at 52,791.

[23] *See, e.g.*, EPA Fact Sheet at 3; Al Armendariz, *Emissions from Natural Gas Production in the Barnett Shale Area and Opportunities for Cost-Effective Improvements* (Jan. 26, 2009) (hereinafter "Barnett Shale Report") at 24, available at http://www.edf.org/documents/9235_Barnett_Shale_Report.pdf, and attached as Exhibit 13.

production and transmission.[24] The primary sources of NO_x are compressor engines, turbines, and other engines used in drilling and hydraulic fracturing.[25] NO_x is also produced when gas is flared or used for heating.[26] VOCs and NO_x contribute to the formation of ground-level ozone (also referred to as smog). Smog pollution harms the respiratory system and has been linked to premature death, heart failure, chronic respiratory damage, and premature aging of the lungs.[27] Smog may also exacerbate existing respiratory illnesses, such as asthma and emphysema, or cause chest pain, coughing, throat irritation and congestion. Children, the elderly, and people with existing respiratory conditions are the most at risk from ozone pollution.[28]

Significant ozone pollution also damages plants and ecosystems.[29] Ozone also contributes substantially to global climate change over the short term. According to a recent study by the United Nations Environment Program (UNEP), behind carbon dioxide and methane, ozone is now the third most significant contributor to human-caused climate change.[30]

As a result of significant VOC and NO_x emissions associated with oil and gas development, numerous areas of the country with heavy concentrations of drilling are now suffering from serious ozone problems. For example, the Dallas Fort Worth area in Texas is home to substantial oil and gas development. Within the Barnett shale region, as of September 2011, there were more than 15,306 gas wells and another 3,212 wells permitted.[31] Of the nine counties surrounding the Dallas Forth Worth area that EPA has designated as "nonattainment" for ozone, five contain significant oil and gas

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[24] *See, e.g.,* TSD at 4-7, 5-6, 6-5, 7-9, 8-1; *see also* Barnett Shale Report at 24.

[25] See, e.g., TSD at 3-6; See also Barnett Shale Report at 24. Air Quality Impact Analysis Technical Support Document for the Revised Draft Supplemental Environmental Impact Statement for the Pinedale Anticline Oil and Gas Exploration and Development Project at 11 (Table 2.1).

[26] TSD at 3-6; Colorado Department of Public Health and Environment, *Colorado Visibility and Regional Haze State Implementation Plan for the Twelve Mandatory Class I Federal Areas in Colorado*, Appendix D at 1 (2011), available at http://www.cdphe.state.co.us/ap/RegionalHaze/AppendixD/4-FactorHeaterTreaters07JAN2011FINAL.pdf, and attached as Exhibit 14.

[27] RIA at 4-25; Jerrett *et al.*, *Long-Term Ozone Exposure and Mortality*, N. Engl. J. Med. 2009; 360:1085-95, *available at* http://www.nejm.org/doi/full/10.1056/NEJMoa0803894#t=articleTop, and attached as Exhibit 15.

[28] *See* EPA, *Ground-Level Ozone, Health Effects*, *available at* http://www.epa.gov/glo/health.html attached as Exhibit 16. EPA, Nitrogen Dioxide, Health, available at http://www.epa.gov/air/nitrogenoxides/health.html, and attached as Exhibit 17.

[29] RIA at 4-26.

[30] *Id. See also* United Nations Environment Programme and World Meteorological Organization, (2011): *Integrated Assessment of Black Carbon and Tropospheric Ozone: Summary for Decision Makers* (hereinafter "UNEP Report," available at http://www.unep.org/dewa/Portals/67/pdf/Black_Carbon.pdf), at 7, and attached as Exhibit 18.

[31] Texas Railroad Commission, "Newark, East (Barnett Shale) Field Discovery Date – 10-15-1981," http://www.rrc.state.tx.us/data/fielddata/barnettshale.pdf (Accessed Nov. 21, 2011), and attached as Exhibit 19.

development.[32] A 2009 study found that summertime emissions of smog-forming pollutants from these counties were roughly comparable to emissions from motor vehicles in those areas.[33]

Oil and gas development has also brought serious ozone pollution problems to rural areas, such as western Wyoming.[34] On March 12, 2009, the governor of Wyoming recommended that the state designate Wyoming's Upper Green River Basin as an ozone nonattainment area.[35] The Wyoming Department of Environmental Quality conducted an extended assessment of the ozone pollution problem and found that it was "primarily due to local emissions from oil and gas . . . development activities: drilling, production, storage, transport, and treating."[36] Last winter alone, the residents of Sublette County suffered thirteen days with ozone concentrations considered "unhealthy" under EPA's current air-quality index, including days when the ozone pollution levels exceeded the worst days of smog pollution in Los Angeles.[37] Residents have faced repeated warnings regarding elevated ozone levels and the resulting risks of going outside.[38]

Ozone problems are mounting in other Rocky Mountain states as well. Northeastern Utah recorded unprecedented ozone levels in the Uintah Basin in 2010 and 2011. In the first three months of 2010—which was the first time that winter ozone was monitored in the region—air quality monitors measured more than 68 exceedances of the federal health standard. On three of these days, the levels were almost twice the federal

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[32] Barnett Shale Report at 1, 3.
[33] *Id.* at 1, 25-26.
[34] Schnell, R.C, et al. (2009), "Rapid photochemical production of ozone at high concentrations in a rural site during winter," *Nature Geosci.* 2 (120 – 122). DOI: 10.1038/NGEO415, attached as Exhibit 20.
[35] *See* Letter from Wyoming Governor Dave Freudenthal to Carol Rushin, Acting Regional Administrator, USEPA Region 8, (Mar. 12, 2009) ("Wyoming 8-Hour Ozone Designation Recommendations"), *available at* http://deq.state.wy.us/out/downloads/Rushin%20Ozone.pdf, and attached as Exhibit 21; Wyoming Department of Environmental Quality, Technical Support Document I for Recommended 8-hour Ozone Designation of the Upper Green River Basin (March 26, 2009) ("Wyoming Nonattainment Analysis"), at vi-viii, 23-26, 94-05, *available at* http://deq.state.wy.us/out/downloads/Ozone%20TSD_final_rev%203-30-09_jl.pdf, and attached as Exhibit 22.
[36] Wyoming Nonattainment Analysis at viii.
[37] EPA, *Daily Ozone AQI Levels in 2011 for Sublette County, Wyoming*, available at http://tinyurl.com/8yq7yhu, and attached as Exhibit 23; *see also* Wendy Koch, "Wyoming's Smog Exceeds Los Angeles' Due to Gas Drilling," *USA Today*, available at http://content.usatoday.com/communities/greenhouse/post/2011/03/wyomings-smog-exceeds-los-angeles-due-to-gas-drilling/1, and ttached as Exhibit 24.
[38] *See, e.g.,* "2011 DEQ Ozone Advisories," *Pinedale Online!* (Mar. 17, 2011) (documenting ten ozone advisories in February and March 2011), available at http://www.pinedaleonline.com/news/2011/03/OzoneCalendar.htm, and attached as Exhibit 25; Wyoming Department of Environmental Quality, Ozone Advisory for Monday, Feb. 28, Pinedale Online! (Feb. 27, 2011), *available at* http://www.pinedaleonline.com/news/2011/02/OzoneAdvisoryforMond.htm, and attached as Exhibit 26.

standard.[39] Between January and March 2011, there were 24 days where the National Ambient Air Quality Standard (NAAQS) for ozone were exceeded in the area. Again, ozone pollution levels climbed to nearly twice the federal standard.[40] The Bureau of Land Management (BLM) has identified the multitude of oil and gas wells in the region as the primary cause of the ozone pollution.[41]

Rampant oil and gas development in Colorado and New Mexico is also leading to high levels of VOCs and NO_x. In 2008, the Colorado Department of Public Health and Environment concluded that the smog-forming emissions from oil and gas operations exceed vehicle emissions for the entire state.[42] Moreover, significant additional drilling has occurred since 2008. Colorado is now home to more than 46,000 wells.[43] There is also significant development in the San Juan Basin in southeastern Colorado and northwestern New Mexico, with approximately 35,000 wells in the Basin. As a result of this development and several coal-fired power plants in the vicinity, the Basin suffers from serious ozone pollution.[44] This pollution is taking a toll on residents of San Juan County. The New Mexico Department of Public Health has documented increased emergency room visits associated with high ozone levels in the County.[45]

VOC and NOx emissions from oil and gas development are also harming air quality in national parks and wilderness areas. Researchers have determined that numerous "Class I areas" – a designation reserved for national parks, wilderness areas, and other such lands[46] – are likely to be impacted by increased ozone pollution as a result of oil and gas development in the Rocky Mountain region, including Mesa Verde National Park

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[39] Scott Streater, "Air Quality Concerns May Dictate Uintah Basin's Natural Gas Drilling Future," *N. Y. Times*, October 1, 2010, *available at* http://www.nytimes.com/gwire/2010/10/01/01greenwire-air-quality-concerns-may-dictate-uintah-basins-30342.html?pagewanted=1 (last visited April 23, 2012), and attached as Exhibit 27.

[40] *See* EPA, AirExplorer: Query Concentrations: Ozone: Uintah County: 2011, attached as Exhibit 28.

[41] BLM, *GASCO Energy Inc. Uinta Basin Natural Gas Development Draft Environmental Impact State*ment ("GASCO DEIS"), at 3-13, available at http://www.blm.gov/ut/st/en/fo/vernal/planning/nepa_/gasco_energy_eis.html, and attached as Exhibit 29.

[42] Colo. Dept. of Public Health & Env't, Air Pollution Control Division, Oil and Gas Emission Sources, *Presentation for the Air Quality Control Commission Retreat*, at 3-4 (May 15, 2008), attached as Exhibit 30.

[43] Colorado Oil & Gas Conservation Commission, *Colorado Weekly & Monthly Oil and Gas Statistics*, at 12 (Nov. 7, 2011), available at http://cogcc.state.co.us/ (library—statistics—weekly/monthly well activity), and attached as Exhibit 31.

[44] *See Four Corners Air Quality Task Force Report of Mitigation Options*, at vii (Nov. 1, 2007), available at http://www.nmenv.state.nm.us/aqb/4C/TaskForceReport.html, and attached as Exhibit 32.

[45] Myers *et al.*, *The Association Between Ambient Air Quality Ozone Levels and Medical Visits for Asthma in San Juan County*, prepared for the Environmental Health Epidemiology Bureau, New Mexico Department of Health, Aug. 2007, available at http://www.nmenv.state.nm.us/aqb/4C/Documents/SanJuanAsthmaDocBW.pdf, and attached as Exhibit 33.

[46] *See* 42 U.S.C. § 7472(a).

and Weminuche Wilderness Area in Colorado and San Pedro Parks Wilderness Area, Bandelier Wilderness Area, Pecos Wilderness Area, and Wheeler Peak Wilderness Area in New Mexico.[47] These areas are all near concentrated oil and gas development in the San Juan Basin.[48]

As oil and gas development moves into new areas, particularly as a result of the boom in development of shale resources, ozone problems are likely to follow. For example, regional air quality models predict that gas development in the Haynesville shale will increase ozone pollution in northeast Texas and northwest Louisiana and may lead to violations of ozone NAAQS.[49] Experts also anticipate air quality problems associated with development of the Marcellus shale in the Mid-Atlantic region.[50] In particular, the state of Delaware has conducted an extensive analysis of NO_x pollution from the oil and gas sector, in part because Delaware is downwind from the Marcellus gas plays which projects like CAMERON's proposal would support.[51] It demonstrates that Delaware and other downwind states will experience significant NO_x pollution if production increases without appropriate controls.

Sulfur dioxide: Oil and gas production emits sulfur dioxide, primarily from natural gas processing plants.[52] Sulfur dioxide is released as part of the sweetening process, which removes hydrogen sulfide from the gas.[53] Sulfur dioxide is also created when gas containing hydrogen sulfide (discussed below) is combusted in boilers or heaters.[54]

Sulfur dioxide causes respiratory problems, including increased asthma symptoms. Short-term exposure to sulfur dioxide has been linked to increased emergency room visits and hospital admissions. Sulfur dioxide reacts in the atmosphere to form particulate matter (PM), an air pollutant which causes a great deal of harm to human health.[55] PM is discussed separately below.

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[47] Rodriguez et al., *Regional Impacts of Oil and Gas Development on Ozone Formation in the Western United States*, J. Air & Waste Manage. Assoc. 59: 1111–1118 (Sept. 2009), available at http://www.wrapair.org/forums/amc/meetings/091111_Nox/Rodriguez_et_al_OandG_Impacts_JAWMA9_09.pdf, and attached as Exhibit 34.

[48] *Id.* at 1112.

[49] *See* Kemball-Cook et al., *Ozone Impacts of Natural Gas development in the Haynesville Shale,* 44 Environ. Sci. Technol. 9357, 9362 (Nov. 18, 2010), attached as Exhibit 35.

[50] Elizabeth Shogren, "Air Quality Concerns Threaten Natural Gas's Image," *National Public Radio* (June 21, 2011), *available at* http://www.npr.org/2011/06/21/137197991/air-quality-concerns-threaten-natural-gas-image, and attached as Exhibit 36.

[51] *See* Delaware Department of Natural Resources and Environmental Quality, *Background Information Oil and Gas Sector Significant Sources of NOx Emissions* (2011) attached as Exhibit 37.

[52] 76 Fed. Reg. at 52,756.

[53] TSD 3-3 to 3-5.

[54] 76 Fed. Reg. at 52,756.

[55] EPA, Sulfur Dioxide, Health, *available at* http://www.epa.gov/air/sulfurdioxide/health.html, and attached as Exhibit 38.

Hydrogen sulfide: Some natural gas contains hydrogen sulfide. When hydrogen sulfide levels are above a specific threshold, gas is classified as "sour gas."[56] According to EPA, there are 14 major areas in the U.S., found in 20 different states, where natural gas tends to be sour.[57] All told, between 15 and 20% of the natural gas in the U.S. may contain hydrogen sulfide.[58]

Given the large amount of drilling in areas with sour gas, EPA has concluded that the potential for hydrogen sulfide emissions from the oil and gas industry is "significant."[59] Hydrogen sulfide may be emitted during all stages of development, including exploration, extraction, treatment and storage, transportation, and refining.[60] For example, hydrogen sulfide is emitted as a result of leaks from processing systems and from wellheads in sour gas fields.[61]

Hydrogen sulfide is an air pollutant with toxic properties that smells like rotten eggs and can lead to neurological impairment or death. Long-term exposure to hydrogen sulfide is linked to respiratory infections, eye, nose, and throat irritation, breathlessness, nausea, dizziness, confusion, and headaches.[62] Although hydrogen sulfide was originally included in the Clean Air Act's list of hazardous air pollutants, it was removed with industry support.[63]

Hydrogen sulfide emissions from the oil and gas industry are concerning because this pollutant may be harmful even at low concentrations.[64] Although direct monitoring of hydrogen sulfide around oil and gas sources is limited, there is evidence that these emissions may be substantial, and have a serious impact on people's health. For

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[56] 76 Fed. Reg. at 52,756. Gas is considered "sour" of hydrogen sulfide concentration is greater than 0.25 grain per 100 standard cubic feet, along with the presence of carbon dioxide. *Id.*

[57] EPA, Office of Air Quality Planning and Standards, *Report to Congress on Hydrogen Sulfide Air Emissions Associated with the Extraction of Oil and Natural Gas* (EPA-453/R-93-045), at ii (Oct. 1993) (hereinafter "EPA Hydrogen Sulfide Report"); *available at* http://tinyurl.com/EPA-Sulfur-Dioxide, and attached as Exhibit 39.

[58] Lana Skrtic, *Hydrogen Sulfide, Oil and Gas, and People's Health,* paper submitted for the fulfillment of a Masters Degree, Energy and Resources Group, UC Berkeley, at 6 (May 2006), (hereinafter "Skrtic Report"), available at http://www.earthworksaction.org/pubs/hydrogensulfide_oilgas_health.pdf, and attached as Exhibit 40.

[59] EPA Hydrogen Sulfide Report at III-35.

[60] *Id.* at ii.

[61] TSD at 2-3.

[62] EPA Hydrogen Sulfide Report at i.

[63] *See* Pub. L. 102-187 (Dec. 4, 1991). We do not concede that this approval was appropriate. Hydrogen sulfide meets section 112 of the Clean Air Act's standards for listing as a hazardous air pollutant, and should be so regulated.

[64] *See* James Collins & David Lewis, "Hydrogen Sulfide: Evaluation of Current California Air Quality Standards with Respect to Protections of Children," *Prepared fro the California Air Resources Board – California Office of Environmental Health Hazard Assessment*, (Sept. 1, 2000), available at http://oehha.ca.gov/air/pdf/oehhah2s.pdf, and attached as Exhibit 41.

example, North Dakota reported 3,300 violations of an odor-based hydrogen sulfide standard around drilling wells.[65] People in northwest New Mexico and western Colorado living near gas wells have long complained of strong odors, including but not limited to hydrogen sulfide's distinctive rotten egg smell. Residents have also experienced nose, throat and eye irritation, headaches, nose bleeds, and dizziness.[66] An air sample taken by a community monitor at one family's home in western Colorado in January 2011 contained levels of hydrogen sulfide concentrations 185 times higher than safe levels.[67]

Particulate Matter (PM): The oil and gas industry is a major source of PM pollution. This pollution is generated by heavy equipment used to move and level earth during well pad and road construction. Vehicles also generate fugitive dust by traveling on access roads during drilling, completion, and production activities.[68] Diesel engines used in drilling rigs and at compressor stations are also large sources of fine PM/diesel soot emissions. VOCs are also a precursor to formation of $PM_{2.5}$.[69]

PM consists of tiny particles of a range of sizes suspended in air. Small particles pose the greatest health risk. These small particles include "inhalable coarse particles," which are smaller than 10 micrometers in diameter (PM_{10}), and "fine particles" which are less than 2.5 micrometers in diameter ($PM_{2.5}$). PM_{10} is primarily formed from crushing, grinding or abrasion of surfaces. $PM_{2.5}$ is primarily formed by incomplete combustion of fuels or through secondary formation in the atmosphere.[70]

PM causes a wide variety of health and environmental impacts. PM has been linked to respiratory and cardiovascular problems, including coughing, painful breathing, aggravated asthma attacks, chronic bronchitis, decreased lung function, heart attacks, and premature death. Sensitive populations, include the elderly, children, and people with existing heart or lung problems, are most at risk from PM pollution.[71] PM also reduces visibility,[72] and may damage important cultural resources.[73] Black carbon, a

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[65] EPA Hydrogen Sulfide Report at III-35.
[66] *See* Global Community Monitor, Gassed! Citizen Investigation of Toxic Air Pollution from Natural Gas Development, at 11-14 (July 2011), attached as Exhibit 42.
[67] *Id.* at 21.
[68] *See* GASCO DEIS at 2.
[69] RIA at 4-18.
[70] *See* EPA, "Particulate Matter – Health," *available at* http://www.epa.gov/pm/health.html, and attached as Exhibit 43; BLM, *West Tavaputs Plateau Natural Gas Full Field Development Plan Final Environmental Impact Statement* ("West Tavaputs FEIS"), at 3-19 (July 2010), available at http://www.blm.gov/ut/st/en/fo/price/energy/Oil_Gas/wtp_final_eis.html (click "Chapter 3 - Affected Environment"), and attached as Exhibit 44.
[71] RIA at 4-19; EPA, "Particulate Matter – Health."
[72] EPA "Visibility – Basic Information" http://www.epa.gov/visibility/what.html, and attached as Exhibit 45.
[73] *See* EPA, "Particulate Matter – Health"; West Tavaputs EIS, at 3-19; RIA at 4-24.

component of PM emitted by combustion sources such as flares and older diesel engines, also warms the climate and thus contributes to climate change.[74]

PM emissions from the oil and gas industry are leading to significant pollution problems. For example, monitors in Uintah County and Duchesne County, Utah have repeatedly measured wintertime $PM_{2.5}$ concentrations above federal standards.[75] These elevated levels of $PM_{2.5}$ have been linked to oil and gas activities in the Uinta Basin.[76] West Tavaputs FEIS at 3-20. Modeling also shows that road traffic associated with energy development is pushing PM_{10} levels very close to violating NAAQS standards.[77]

2. Recent Studies Indicate Even Greater Air Quality Impacts

The air quality risks discussed above are serious but the most recent studies available demonstrate that those risks, if anything, underestimated. These studies, based on direct monitoring of gas operations in Colorado, show actual emissions larger than those in EPA's estimates, and links unconventional gas drilling, specifically, to increased cancer risk. These serious threats to public health and the environment argue strongly against granting this application.

The first of these studies, by a consortium of researchers led by the National Ocean and Atrmospheric Administration (NOAA) Earth System Research Laboratory, monitored air quality around oil and gas fields.[78] It observed high levels of methane, propane, benzene, and other volatile organic compounds, in the air around the fields. The researchers write that their "analysis suggests that the emissions of the species we measured" – that is the cancer-causing, smog-forming, and climate-disrupting pollutants released from these operations – "are most likely underestimated in current inventories," perhaps by as much as a factor of two.[79]

These emissions have dire practical consequences. A second research team, led by the Colorado School of Public Health, measured benzene and other pollutants released from unconventional well completions.[80] Elevated levels of these pollutants correspond to increased cancer risks for people living within half of a mile from a well[81] – a very large population which will increase as drilling expands. Thus, the increased gas production

[74] UNEP Report at 6; IPCC (2007) at Section 2.4.4.3.
[75] GASCO DEIS at 3-12.
[76] West Tavaputs FEIS, at 3-20 (July 2010).
[77] *See* GASCO DEIS at 4-27.
[78] G. Petron *et al.*, *Hydrocarbon emissions characterization in the Colorado Front Range: A pilot study*, 117 J. of Geophysical Research 4304, DOI 10.1029/2011JD016360 (2012), attached as Exhibit 46.
[79] *Id.* at 4304.
[80] L. McKenzie *et al.*, *Human Health Risk Assessment of Air Emissions from Development of Unconventional Natural Gas Resources*, Science of the Total Environment (In Press, Mar. 22, 2012), attached as Exhibit 47.
[81] *Id.* at 2.

that Freeport touts comes along with increased cancer risk in the areas where that production occurs.

In short, the more we learn about pollution associated with unconventional gas production, the worse that pollution appears to be. DOE/FE must weigh these risks as it considers this license; if it weighs them properly, it must conclude that the proposal is not in the public interest because increased production substantially threatens public health.

3. EPA's Air Rules Will Not Fully Address These Air Pollution Problems

Although EPA's recently promulgated new source performance standards and standards for hazardous air pollutants will reduce some of these pollution problems, they will not solve them. The rules, first, do not even address some pollutants, including NO_x, methane, and hydrogen sulfide. Second, the rules do not control existing sources of air pollution (though they do require emissions controls at well completions of existing unconventional wells), meaning that increased use of existing infrastructure will produce emissions uncontrolled by the rules. Third, without full enforcement, the rules will not reduce emissions completely. Fourth, the rules will not address important emissions effects of LNG in particular, including LNG exports' tendency to increase the use of coal power. Thus, though DOE/FE might work with EPA to fully understand the emissions levels likely after the rules are fully implemented, it may not rely upon the EPA rules to avoid weighing and disclosing these impacts.

ii. Gas Production Disrupts Landscapes and Habitats

Increased oil and gas production will transform the landscape of regions overlying shale gas plays, bringing industrialization to previously rural landscapes and significantly affecting ecosystems, plants, and animals. These impacts are large, and difficult to manage.

Land use disturbance associated with gas development impacts plants and animals through direct habitat loss, where land is cleared for gas uses, and indirect habitat loss, where land adjacent to direct losses loses some of its important characteristics.

Regarding direct losses, land is lost through development of well pads, roads, pipeline corridors, corridors for seismic testing, and other infrastructure. The Nature Conservancy ("TNC") estimated that in Pennsylvania, "Well pads occupy 3.1 acres on average while the associated infrastructure (roads, water impoundments, pipelines) takes up an additional 5.7 acres, or a total of nearly 9 acres per well pad." TNC,

Pennsylvania Energy Impacts Assessment, Report 1: Marcellus Shale Natural Gas and Wind (2010) at 10, *see also id.* at 18.[82] New York's Department of Environmental Conservation reached similar estimates. New York Department of Environmental Conservation's Revised Draft Supplemental General Environmental Impact Statement on the Oil, Gas and Solution Mining Regulatory Program, 5-5 (Sept. 2011) (hereinafter "NY RDSGEIS").[83] After initial drilling is completed a portion of the well pad is restored, but 1 to 3 acres of the well pad will remain disturbed through the life of the wells, estimated to be 20 to 40 years. *Id.* at 6-13. Associated infrastructure such as roads and corridors will likewise remain disturbed. Because these disturbances involve clearing and grading of the land, directly disturbed land is no longer suitable as habitat. *Id.* at 6-68.

Indirect losses occur on land that is not directly disturbed, but where habitat characteristics are affected by direct disturbances. "Adjacent lands can also be impacted, even if they are not directly cleared. This is most notable in forest settings where clearings fragment contiguous forest patches, create new edges, and change habitat conditions for sensitive wildlife and plant species that depend on "interior" forest conditions." TNC, *Pennsylvania Energy Impacts Assessment, Report 1: Marcellus Shale Natural Gas and Wind* at 10. "Research has shown measureable impacts often extend at least 330 feet (100 meters) into forest adjacent to an edge." NY RDSGEIS 6-75.

TNC's study of the impacts of gas extraction in Pennsylvania is particularly telling. TNC mapped projected wells across the state, considering how the wells and their associated infrastructure, including roads and pipelines, interacted with the landscape. TNC's conclusions make for grim reading. It concluded:

- About 60,000 new Marcellus wells are projected by 2030 in Pennsylvania with a range of 6,000 to 15,000 well pads, depending on the number of wells per pad;

- Wells are likely to be developed in at least 30 counties, with the greatest number concentrated in 15 southwestern, north central, and northeastern counties;

- Nearly two thirds of well pads are projected to be in forest areas, with forest clearing projected to range between 34,000 and 83,000 acres depending on the number of number of well pads that are developed. An additional range of 80,000 to 200,000 acres of forest interior habitat impacts are projected due to new forest edges created by well pads and associated infrastructure (roads, water impoundments);

- On a statewide basis, the projected forest clearing from well pad development would affect less than one percent of the state's forests, but forest clearing and

[82] Attached as Exhibit 48.
[83] Available at http://www.dec.ny.gov/energy/75370.html, and attached as Exhibit 49.

fragmentation could be much more pronounced in areas with intensive Marcellus development;

- Approximately one third of Pennsylvania's largest forest patches (>5,000 acres) are projected to have a range of between 1 and 17 well pads in the medium scenario;

- Impacts on forest interior breeding bird habitats vary with the range and population densities of the species. The widely-distributed scarlet tanager would see relatively modest impacts to its statewide population while black-throated blue warblers, with a Pennsylvania range that largely overlaps with Marcellus development area, could see more significant population impacts;

- Watersheds with healthy eastern brook trout populations substantially overlap with projected Marcellus development sites. The state's watersheds ranked as "intact" by the Eastern Brook Trout Joint Venture are concentrated in north central Pennsylvania, where most of these small watersheds are projected to have between two and three dozen well pads;

- Nearly a third of the species tracked by the Pennsylvania Natural Heritage Program are found in areas projected to have a high probability of Marcellus well development, with 132 considered to be globally rare or critically endangered or imperiled in Pennsylvania. Several of these species have all or most of their known populations in Pennsylvania in high probability Marcellus gas development areas.

- Marcellus gas development is projected to be extensive across Pennsylvania's 4.5 million acres of public lands, including State Parks, State Forests, and State Game Lands. Just over 10 percent of these lands are legally protected from surface development.

TNC, *Pennsylvania Energy Impacts Assessment, Report 1: Marcellus Shale Natural Gas and Wind* (2010) at 29.[84] Harm to these species and their habitat is, too, against the profound public interest in species conservation, as expressed in the Endangered Species Act and similar statutes.

Increased gas production will exacerbate these problems, which is bad news for the state's lands and wildlife, and the hunting, angling, tourism, and forestry industries that depend upon them. Although TNC adds that impacts could be reduced with proper planning, *id.*, more development makes mitigation more difficult. Indeed, the Pennsylvania Department of Conservation and Natural Resources recently concluded

[84] See Exhibit 48.

that "zero" remaining acres of the state forests are suitable for leasing with surface disturbing activities, or the forests will be significantly degraded. Penn. Dep't of Conservation and Natural Resources, *Impacts of Leasing Additional State Forest for Natural Gas Development* (2011).[85]

Although these studies looked to Pennsylvania and New York, the issues they identify apply to other shale plays. These effects are not in the public interest. These effects will harm rural economies and decrease property values, as major gas infrastructure transforms and distorts the existing landscape.

iii. Gas Production Poses Risks to Ground and Surface Water

Hydraulic fracturing involves injecting a base fluid (typically water),[86] sand or other proppant, and various fracturing chemicals into the gas-bearing formation at high pressures to fracture the rock and release additional gas. The process can be roughly divided into three steps, each of which presents a risk to water resources. First, withdrawal of the water may overtax the water source. Second, the injection of fluid may contaminate groundwater with either chemicals added to the fracturing fluid or with naturally occurring chemicals mobilized by fracking. Third, after the well is fracked, some water will return to the surface, composed of both fracturing fluid and naturally occurring "formation" water. Disposal of this water, together with drilling muds and drill cuttings, poses further risks to surface and ground water resources.

1. Water Withdrawal

The first step is the procurement of water. The precise amount of water varies by the shale formation being fracked. DOE has stated that on average, fracking a well requires between 1 and 5 million gallons of water.[87] Fresh water constitutes 80% to 90% of the total water used, even where operators recycle "flowback" water used from previous frack jobs. NY RDSGEIS (Exhibit 49) at 6-13.

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[85] Attached as Exhibit 50.

[86] The majority of hydraulic fracturing operations are conducted with a water based fracturing fluid. Fracking may also be conducted with oil or synthetic-oil based fluid, with foam, or with gas.

[87] *See* SEAB 90-Day Report at 19 (estimating that nationwide, fracking an individual well requires between 1 and 5 million gallons of water). Other estimates are that as much as 7.2 million gallons of frack fluid may be used in a 4000 foot well bore. NRDC, *et al.*, *Comment on NY RDSGEIS on the Oil, Gas and Solution Mining Regulatory Program* (Jan. 11, 2012) (Attachment 2, Report of Tom Myers, at 10), attached as Exhibit 51 (hereafter *Comment on NY RDSGEIS*). *See also* TNC, *Pennsylvania Energy Impacts Assessment, Report 1: Marcellus Shale Natural Gas and Wind*, 5 (fracking a Marcellus Shale well requires between 4 and 5 million gallons of water); NY RDSGEIS (Exhibit 49) ("Between July 2008 and February 2011, average water usage for high-volume hydraulic fracturing within the Susquehanna River Basin in Pennsylvania was 4.2 million gallons per well, based on data for 553 wells.").

Water withdrawals can drastically impact aquatic ecosystems and human communities. Reductions in instream flow negatively affect aquatic species by changing flow depth and velocity, raising water temperature, changing oxygen content, and altering streambed morphology. *Id.* 6-3 to 6-4. Even when flow reductions are not themselves problematic, the intake structures can harm aquatic organisms. *Id.* at 6-4. Where water is withdrawn from aquifers, rather than surface sources, withdrawal risks permanent depletion. This risk is even more prevalent with withdrawals for fracking than it is for other withdrawal, because fracking is a consumptive use. Fluid injected during the fracking process is (barring accident) deposited below freshwater aquifers and into sealed formations. *Id.* 6-5; DOE Subcommittee First 90 day report at 19 ("in some regions and localities there are significant concerns about consumptive water use for shale gas development."). Thus, the water withdrawn from the aquifer will be used in a way that provides no opportunity to percolate back down to the aquifer and recharge it.

2. Fracturing

Fracturing poses a serious risk of groundwater contamination. Contaminants include chemicals added to the fracturing fluid and naturally occurring chemicals that are mobilized from deeper formations to groundwater by the fracking process. Contamination may occur through several methods, including where the well casing fails or where the created fractures intersect an existing a poorly sealed well. Although information on groundwater contamination is incomplete, the available research indicates that contamination has already occurred on multiple occasions.

One category of potential contaminants includes chemicals added to the drilling mud and fracturing fluid. The fluid used for slickwater fracturing is typically comprised of more than 98% fresh water and sand, with chemical additives comprising 2% or less of the fluid. NY RDSGEIS 5-40. Chemicals are added as solvents, surfactants, friction reducers, gelling agents, bactericides, and for other purposes. *Id.* 5-49. New York recently identified 322 unique ingredients used in fluid additives, recognizing that this constituted a partial list. *Id.* 5-41. These chemicals include petroleum distillates; aromatic hydrocarbons; glycols; glycol ethers; alcohols and aldehydes; amides; amines; organic acids, salts, esters and related chemicals; microbicides; and others. *Id.* 5-75 to 5-78. Many of these chemicals present health risks. *Id.* Of particular note is the use of diesel, which the DOE Subcommittee has singled out for its harmful effects and recommended be banned from use as a fracturing fluid additive. DOE Subcommittee First 90-Day Report (Exhibit 6), 25. The minority staff of the House Committee on Energy and Commerce determined that despite diesel's risks, between 2005 and 2009 "oil and gas service companies injected 32.2 million gallons of diesel fuel or hydraulic fracturing fluids containing diesel fuel in wells in 19 states." Natural Resources Defense Council, Earthjustice, and Sierra Club, *Comments [to EPA] on Permitting Guidance for Oil and Gas Hydraulic Fracturing Activities Using Diesel Fuels* (June 29, 2011) at 3 (quoting Letter

from Reps. Waxman, Markey, and DeGette to EPA Administrator Lisa Jackson (Jan. 31, 2001) at 1) (hereafter Comment on Diesel Guidance).[88]

Contamination may also result from chemicals naturally occurring in the formation. Flowback and produced water "may include brine, gases (*e.g.* methane, ethane), trace metals, naturally occurring radioactive elements (*e.g.* radium, uranium) and organic compounds." DOE Subcommittee first 90 day report at 21; *see also* Comment on NY RDSGEIS (attachment 3, Report of Glen Miller, at 2). For example, mercury naturally occurring in the formation becomes mixed in with water-based drilling muds, resulting in up to 5 pounds of mercury in the mud per well drilled in the Marcellus region. Comment on NY RDSGEIS (attachment 1, Report of Susan Harvey, at 92).

There are several vectors by which these chemicals can reach groundwater supplies. Perhaps the most common or significant are inadequacies in the casing of the vertical well bore. DOE Subcommittee First 90 Day Report, 20. The well bore inevitably passes through geological strata containing groundwater, and therefore provides a conduit by which chemicals injected into the well or traveling from the target formation to the surface may reach groundwater. The well casing is designed to isolate the groundwater from intermediate strata and the target formation. This casing must be strong enough to withstand the pressures of the fracturing process--the very purpose of which is to shatter rock. Multiple layers of steel casing must be used, each pressure tested before use, then centered within the well bore. Each layer of casing must be cemented, with careful testing to ensure the integrity of the cementing. Comment on Diesel Guidance, 5-9. Proper casing construction is an elaborate engineering effort, with multiple layers of steel casing (that have been pressure tested), centralizers to center the casing in the well bore, careful cementing of the casing strings (together with testing to ensure the integrity of this cementing). *Id.* Errors in the design or installation of the cement can allow the cement itself to be punctured or can lead to an incomplete seal between the cement and the surrounding earth, allowing contaminants to travel upward along the outside of the cement and casing and thereby reach the water-bearing strata the well inevitably pierces. *DOE Subcommittee First 90 Day Report,* 20.

Separate from casing failure, contamination may occur when the zone of fractured rock intersects an abandoned and poorly-sealed well or natural conduit in the rock. Comment on NY RDSGEIS (Attachment 3, Report of Tom Myers, 12 - 15).

Fracking has resulting in groundwater contamination in at least five documented instances, according to available research. The DOE Subcommittee summarized three of these studies in its August report. One study "documented the higher concentration of methane originating in shale gas deposits . . . into wells surrounding a producing shale production site in northern Pennsylvania." DOE Subcommittee first 90 day report at 20

[88] Attached as Exhibit 52.

(citing Stephen G. Osborn, Avner Vengosh, Nathaniel R. Warner, and Robert B. Jackson, *Methane contamination of drinking water accompanying gas-well drilling and hydraulic fracturing*, Proceedings of the National Academy of Science, 108, 8172-8176, (2011)). By looking at particular isotopes of methane, this study was able to determine that the methane originated in the shale deposit, rather than from a shallower source. *Id.* The DOE Subcommittee referred to this as "a recent, credible, peer-reviewed study." *Id.* Two other reports "have documented or suggested the movement of fracking fluid from the target formation to water wells linked to fracking in wells." Comment on NY RDSGEIS (Attachment 2, Report of Tom Meyers, 13). "Thyne (2008)[89] had found bromide in wells 100s of feet above the fracked zone." *Id.* "The EPA (1987)[90] documented fracking fluid moving into a 416- foot deep water well in West Virginia; the gas well was less than 1000 feet horizontally from the water well, but the report does not indicate the gas-bearing formation." *Id.*

More recently, EPA has investigated groundwater contamination in Pavillion, Wyoming and Dimock, Pennsylvania. In Pavillion, EPA's draft report concludes that "when considered together with other lines of evidence, the data indicates likely impact to ground water that can be explained by hydraulic fracturing." EPA, Draft Investigation of Ground Water Contamination near Pavillion, Wyoming (Dec. 2011), at xiii.[91] EPA tested water from wells extending to various depths within the range of local groundwater. At the deeper tested wells, EPA discovered inorganics (potassium, chloride), synthetic organic (isopropanol, glycols, and tert-butyl alcohol), and organics (BTEX, gasoline and diesel range organics) at levels higher than expected. *Id.* at xii. At shallower levels, EPA detected "high concentrations of benzene, xylenes, gasoline range organics, diesel range organics, and total purgeable hydrocarbons." *Id.* at xi. EPA determined that surface pits previously used for storage of drilling wastes and produced/flowback waters were a likely source of contamination for the shallower waters, and that fracturing likely explained the deeper contamination. *Id.* at xi, xiii. Although this is a draft report in an ongoing investigation, it demonstrates a possibility of contamination that DOE must consider in its public interest evaluation.

EPA's other recent local investigation examines groundwater contamination in Dimock, Pennsylvania. EPA Region III, *Action Memorandum - Request for Funding for a Removal*

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[89] Dr. Meyers relied on Thyne, G. 2008. *Review of Phase II Hydrogeologic Study.* Prepared for Garfield County, Colorado.

[90] Environmental Protection Agency. 1987. *Report to Congress, Management of Wastes from the Exploration, Development, and Production of Crude Oil, Natural Gas, and Geothermal Energy, Volume 1 of 3, Oil and Gas.* Washington, D.C., available at nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=20012D4P.txt, and attached as Exhibit 53.

[91] Available at http://www.epa.gov/region8/superfund/wy/pavillion/EPA_ReportOnPavillion_Dec-8-2011.pdf, and attached as Exhibit 54.

Action at the Dimock Residential Groundwater Site (Jan. 19, 2012).[92] In Dimock, EPA has determined that "a number of home wells in the Dimock area contain hazardous substances, some of which are not naturally found in the environment." *Id.* at 1. Specifically, wells are contaminated with arsenic, barium, bis(2-ethylhexyl)phthalate, glycol compounds, manganese, phenol, and sodium. *Id.* at 3-4. Many of these chemicals are hazardous substances as defined under CERCLA section 101(14); *see also* 40 C.F.R. § 302.4. EPA's initial determination was based on "Pennsylvania Department of Environmental Protection (PADEP) and Cabot Oil and Gas Corporation (Cabot) sampling information, consultation with an EPA toxicologist, the Agency for Toxic Substances and Disease Registry (ATSDR) Record of Activity (AROA), issued, 12/28/11, and [a] recent EPA well survey effort." *Id.* The PADEP information provided reason to believe that drilling activities in the area led to contamination of these water supplies. Drilling in the area began in 2008, and was conducted using the hazardous substances that have since been discovered in well water. *Id.* at 1, 2. Shortly thereafter methane contamination was detected in private well water. *Id.* at 2. In addition, there were several surface spills in connection with the drilling operation. *Id.* at 1. After the contamination was detected, PADEP entered a consent decree with Cabot which required permanent restoration or replacement of the water supply. *Id.* at 2. Cabot has installed or is installing a "gas mitigation" system for the affected wells. *Id., see also* Agency for Toxic Substances and Disease Registry, *Record of Activity/Technical Assist* (Dec. 28, 2011) at 2 (hereafter ATSDR).[93] Pursuant to the consent decree, Cabot was providing replacement water to all 18 homes until November 30, 2011, at which point Cabot halted deliver with PADEP's consent. ATSDR at 2.

EPA is currently undertaking its own testing of approximately 61 of these Dimock wells. *Id.* at 6. As of April 2012, EPA had conducted its initial round of testing on 47 wells. Andrew Maykuth, *No EPA Action after 16 More Dimock Well Tests*, Philadelphia Inquirer (April 20, 2012).[94] This testing has confirmed the presence of contaminants at concerning levels in many wells. For example, one well with arsenic levels nine times greater than the standard EPA has set for public water sources. *Id.* EPA "offer[ed] to provide [this resident] with alternate water." *Id.* (quoting EPA correspondence). Another well contained "barium well above the EPA's maximum level," although an installed treatment system was able to reduce the barium to safe levels. Associated Press, *EPA: Water quality OK at 20 wells in Pa. gas town* (Apr. 6, 2012). Many other tested wells have also showed contamination with methane, chromium, sodium, or bacteria,

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[92] Available at http://www.epaosc.org/sites/7555/files/Dimock%20Action%20Memo%2001-19-12.PDF, and attached as Exhibit 55.

[93] Attached as Exhibit 56.

[94] Available at http://articles.philly.com/2012-04-20/business/31374336_1_water-wells-natural-gas-water-quality, and attached as Exhibit 57; *see also* EPA, *Validated data summary report for the first 47 Dimock households that were sampled*, available at https://www.epaosc.org/sites/7555/files/Dimock%20W1,2,3%20-HW45%20Compulation%20Report.pdf, and attached as Exhibit 58.

although the contaminants did not exceed EPA drinking water standards. *See, e.g.*, Susan Phillips, *EPA's Test Results Show Safe Drinking Water in Dimock* (March 15, 2012).[95] Thus, although EPA's study of Dimock is ongoing, the results available today clearly demonstrate the potential for fracking to contaminate groundwater.

On the basis of the above five studies, DOE/FE must consider the significant danger induced fracking will pose to the nation's groundwater. This danger weighs is contrary to the public interest. DOE/FE should postpone its evaluation of the public interest until the EPA's ongoing studies of the risk fracking poses to water contamination are complete, so that these studies may inform DOE/FE's evaluation.

3. Waste Management

Fracturing produces a variety of liquid and solid wastes that must be managed and disposed of. These include the drilling mud used to lubricate the drilling process, the drill cuttings removed from the well bore, the "flowback" of fracturing fluid that returns to the surface in the days after fracking, and produced water that is produced over the life of the well (a mixture of water naturally occurring in the shale formation and lingering fracturing fluid). These wastes contain the same contaminants described in the preceding section. They present environmental hazards with regard to their onsite management and with their eventual disposal.

On site, the drilling mud, drill cuttings, flowback and produced water are often stored in pits. Such open pits can have harmful air emissions, can leach into shallow groundwater water, and can fail and result in surface discharges. *See, e.g.*, NY RDSGEIS at 1-12. Although many of these harms can be minimized by the use of seal tanks in a "closed loop" system, New Mexico is the only jurisdiction to presently mandate such a system. Thus, throughout the majority of shale plays, temporary storage of fracking waste presents a distinct risk to air and water.

Flowback and produced water must ultimately be disposed of offsite. Some of these fluids may be recycled and used in further fracturing operations, but even where a fluid recycling program is used, recycling leaves concentrated contaminants that must be disposed of. The most common methods of disposal are disposal in underground injection wells or through water treatment facilities leading to eventual surface discharge. Both methods of disposal present significant environmental risks.

Underground injection wells present risks of groundwater contamination similar to those identified above for the hydraulic fracturing process. Gas production wastes are not categorized as hazardous under the Safe Drinking Water Act, 42 U.S.C. § 300f *et*

[95] Available at http://stateimpact.npr.org/pennsylvania/2012/03/15/epas-test-results-show-safe-drinking-water-in-dimock/, and attached as Exhibit 59.

seq., and may be disposed of in Class II injection wells. Class II wells are brine disposal wells, and the standards and safeguards in place for these wells were not designed with the contaminants found in fracking wastes in mind. *See also* NRDC *et al.*, Petition for Rulemaking Pursuant to Section 6974(a) of the Resource Conservation and Recovery Act Concerning the Regulation of Wastes Associated with the Exploration, Development, or Production of Crude Oil or Natural Gas or Geothermal Energy (Sept. 8, 2010).[96]

Underground injection of fracking wastes has also induced earthquakes. In Ohio, underground injection of fracking waste has been correlated with earthquakes as high as 4.0 on the Richter scale. Columbia University, Lamont-Doherty Earth Observatory, *Ohio Quakes Probably Triggered by Waste Disposal Well, Say Seismologists* (Jan. 6, 2012).[97] "Once fluid enters a preexisting fault, it can pressurize the rocks enough to move; the more stress placed on the rock formation, the more powerful the earthquake." *Id.* Underground injection is more likely than fracking to trigger large earthquakes via this mechanism, "because more fluid is usually being pumped underground at a site for longer periods." *Id.* In light of the apparent induced seismicity, Ohio has put a moratorium on injection in the affected region. *Id.* Similar associations between earthquakes and injection have occurred in Arkansas, Texas, Oklahoma and the United Kingdom. *Id*., Alexis Flynn, "Study Ties Fracking to Quakes in England," *Wall Street Journal* (Nov. 3, 2011).[98] In light of these effects, Ohio and Arkansas have placed moratoriums on injection in the affected areas. Lamont-Doherty Earth Observatory; Arkansas Oil and Gas Commission, *Class II Commercial Disposal Well or Class II Disposal Well Moratorium* (Aug. 2, 2011).[99] The recently released abstract of a forthcoming United States Geological Survey study affirms the connection between disposal wells and earthquakes. Ellsworth, W. L., *et al*., *Are Seismicity Rate Changes in the Midcontinent Natural or Manmade?*, Seismological Society of America, (April 2012).[100]

As an alternative to underground injection, flowback and produced water is also sent to water treatment facilities, leading to eventual surface discharge. This presents a separate set of environmental hazards, because these facilities (particularly publicly owned treatment works) are not designed to handle the nontraditional pollutants found in fracking wastes. For example:

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[96] Available at http://docs.nrdc.org/energy/files/ene_10091301a.pdf, and attached as Exhibit 60.
[97] Available at http://www.ldeo.columbia.edu/news-events/seismologists-link-ohio-earthquakes-waste-disposal-wells, and attached as Exhibit 61.
[98] Available at http://online.wsj.com/article/SB10001424052970203804204577013771109580352.html, and attached as Exhibit 62.
[99] Available at http://www.aogc.state.ar.us/Hearing%20Orders/2011/July/180A-2-2011-07.pdf, and attached as Exhibit 63.
[100] This abstract is available at http://www2.seismosoc.org/FMPro?-db=Abstract_Submission_12&-recid=224&-format=%2Fmeetings%2F2012%2Fabstracts%2Fsessionabstractdetail.html&-lay=MtgList&-find, and attached as Exhibit 64.

> One serious problem with the proposed discharge (dilution) of fracture treatment wastewater via a municipal or privately owned treatment plant is the observed increases in trihalomethane (THM) concentrations in drinking water reported in the public media (Frazier and Murray, 2011), due to the presence of increased bromide concentrations. Bromide is more reactive than chloride in formation of trihalomethanes, and even though bromide concentrations are generally lower than chloride concentrations, the increased reactivity of bromide generates increased amounts of bromodichloromethane and dibromochloromethane (Chowdhury, et al., 2010). Continued violations of an 80microgram/L THM standard may ultimately require a drinking water treatment plant to convert from a standard and cost effective chlorination disinfection treatment to a more expensive chloramines process for water treatment. Although there are many factors affecting THM production in a specific water, simple (and cheap) dilution of fracture treatment water in a stream can result in a more expensive treatment for disinfection of drinking water. This transfer of costs to the public should not be permitted.

Comment on NY RDSGEIS (attachment 3, Report of Glen Miller, at 13). Similarly, municipal treatment works typically to not treat for radioactivity, whereas produced water can have high levels of naturally occurring radioactive materials. In one examination of three samples of produced water, radioactivity (measured as gross alpha radiation) were found ranging from 18,000 pCi / L to 123,000 pCi/L, whereas the safe drinking water standard is 15 pCi/L. *Id.* (Miller Report at 4).

Thus, fracking and shale gas extraction pose numerous threats to the nation's water resources. These threats include taxation of existing water supplies, contamination risks to groundwater as a result of well completion and wastewater disposal, hazards resulting from storage of wastes at the drill site, and the difficulty of long-term disposal of fracking wastes. Because Cameron's proposal will induce significant additional fracking, the proposal will increase each of these risks, and that increase weighs against a finding that the proposal is in the public interest.

b. The Project Will Harm The Environment by Inducing Some Domestic Electricity Generators to Switch from Gas to Coal

In addition to the above production-related impacts, Cameron's proposal will also impose negative effects on the consumption side as well. Specifically, Cameron's proposal will increase air pollution by increasing the about of coal used for electricity

production. The EIA predicts that LNG export will increase domestic natural gas prices, including potential wellhead price increases of 10 to 50% at export levels below those currently proposed. *EIA Study* at 6, 8. These price increases will decrease domestic consumption of natural gas, primarily in the electric power sector. *Id.* at 6. The power sector will "primarily" respond by shifting to coal-fired generation, and only secondarily to renewable sources. *Id.*, *see also id.* at 17 (“higher natural gas prices lead electric generators to burn more coal and less natural gas.”). Specifically, EIA predicts that the decrease in 72 percent of the decrease in gas-fired electricity production will be replaced by coal-fired production, with increased liquid fuel consumption, increased renewable generation, and decreases in total consumption making up the remainder (8, 9, and 11 percent, respectively). *Id.* at 18.

The shift from gas- to coal-fired electricity generation will increase emissions of both traditional air pollutants and greenhouse gases. As Cameron itself asserts, gas-fired power plants generate more sulfur dioxide, particulate matter, and other pollution than coal-fired plants. Cameron Application at 27, 27 n.60. Coal-fired generation also emits roughly twice the greenhouse gases than equivalent gas-fired generation, *id.*, although as discussed in the following section, this combustion advantage is partially offset by the greenhouse gas emissions resulting from gas production.

The displacement of gas by coal will increase domestic greenhouse gas emissions. The result is yet more greenhouse gas pollution. The *EIA Study* examined the effects of 6 and 12 bcf/d of exports, phased in slowly or quickly, together with various estimates for the extent of shale gas reserves and the pace of US economic development. EIA concluded that under every scenario exports would produce a significant increase in domestic greenhouse gas emissions, as illustrated by the table below.

Table 1: Cumulative CO_2 Emissions from 2015 to 2035 with Various Export Scenarios[101]

Case	no added exports	low/slow	low/rapid	high/slow	high/rapid
Reference					
Cumulative carbon dioxide emissions	125,056	125,699	125,707	126,038	126,283
Change from baseline		643	651	982	1,227
Percentage change from baseline		0.5%	0.5%	0.8%	1.0%
High Shale EUR					
Cumulative carbon dioxide emissions	124,230	124,888	124,883	125,531	125,817
Change from baseline		658	653	1,301	1,587
Percentage change from baseline		0.5%	0.5%	1.0%	1.3%
Low Shale EUR					
Cumulative carbon dioxide emissions	125,162	125,606	125,556	125,497	125,670
Change from baseline		444	394	335	508
Percentage change from baseline		0.4%	0.3%	0.3%	0.4%
High Economic Growth					
Cumulative carbon dioxide emissions	131,675	131,862	132,016	131,957	132,095
Change from baseline		187	341	282	420
Percentage change from baseline		0.1%	0.3%	0.2%	0.3%

Source: U.S. Energy Information Administration, National Energy Modeling System, with emissions related to natural gas assumed to be consumed in the liquefaction process included.

The fact that gas exports will tend to favor coal as a fuel for electrical generation has particularly important implications for national emissions control efforts. EPA has just released proposed carbon pollution standards for electricity generating units which set emissions levels based upon the performance of natural gas combined-cycle plants. *See*77 Fed. Reg. 22,392 (Apr. 13, 2012). EPA anticipates no notable compliance costs for the rule because it expects utilities to react to low gas prices, among other factors, by avoiding constructing expensive coal-fired plants. *See id.* at 22,430. If LNG exports move forward, however, gas prices will increase, making it more difficult and expensive to capture combustion-side carbon pollution reductions from fossil-fuel fired power plants. This interference with national efforts to control global warming, which endangers public health and welfare, *see* 74 Fed. Reg. 66,496 (Dec. 15, 2009), is not in the public interest.

3. Cameron's Claimed Environmental Benefits Are Overstated, as Exporting LNG Is Unlikely to Reduce Global Greenhouse Gas Emissions

Cameron argues that LNG export will benefit the environment by "displac[ing] the consumption of coal in power generation and deter[ing] the construction of additional coal-fired generation capacity" in importing nations, leading to "substantial" "potential reductions in global greenhouse gas emissions." Cameron Application at 27. This

[101] From the *EIA Study* at 19.

argument rests a study that underestimates greenhouse gas emissions resulting from natural gas production by over 95%, when measured against current studies. Prevailing estimates of LNG lifecycle emissions demonstrate that LNG has little, if any, greenhouse gas emission advantage over coal.[102]

Before addressing Cameron's underestimate of production emissions, we highlight the distinction between domestic gas use and international trade in LNG. Liquefying natural gas is an energy intensive process. Cameron's application demonstrates this fact by predicting that, in order to liquefy 1.7 bcf/d of gas, the terminal will consume an additional 0.2 bcf/d of gas. Additional energy is then consumed in the transportation of the gas, with attendant greenhouse gas emissions. Finally, the LNG must be regasified at the import terminal, often by being heated with the combustion of other gas. In discussing these emissions, Cameron adopts a report from Pace Global and commissioned by an LNG import industry group.[103] The Pace Report's estimates of emissions from the LNG process are lower than, but roughly in accord with, those used in peer reviewed literature, as summarized in the following table. *See, e.g.*, Paulina Jaramillo, W. Michael Griffin, H. Scott Matthews, *Comparative Life-Cycle Air Emissions of Coal, Domestic Natural Gas, LNG, and SNG for Electricity Generation*, 41 Environ. Sci. Technol. 6,290 (2007) (Jaramillo 2007).[104]

[102] We further note that Cameron has provided no evidence that LNG export will in fact displace use of coal and other fossil fuels in the receiving countries.

[103] Pace, *Life Cycle Assessment of GHG Emissions from LNG and Coal Fired Generation Scenarios: Assumptions and Results* (February 3, 2009) ("*Pace Report*"). This report was commissioned by the Center for Liquefied Natural Gas, and considers LNG imports, rather than exports. *Id.* at 2. Cameron adopts this report at Cameron Application at 27 n.61 and n.62.

[104] Available at http://www.ce.cmu.edu/~gdrg/readings/2007/09/13/Jaramillo_ComparativeLCACoalNG.pdf, and attached as Exhibit 65. The supporting information for this article is available at http://pubs.acs.org/doi/suppl/10.1021/es063031o/suppl_file/es063031osi20070516_042542.pdf, and attached as Exhibit 66 ("Jamarillo Supporting Information"). An earlier, related report with some additional information is Paulina Jaramillo, W. Michael Griffin, H. Scott Matthews, *Comparative Life Cycle Carbon Emissions of LNG Versus Coal and Gas for Electricity Generation* (2005), available at http://www.ce.cmu.edu/~gdrg/readings/2005/10/12/Jaramillo_LifeCycleCarbonEmissionsFromLNG.pdf, and attached as Exhibit 67.

Table 2: Emissions from LNG Processing

Adapted from Pace Report and Jaramillo 2005 and 2007. Figures are in pounds of CO_2e per MMBtu (million British thermal units) of gas.

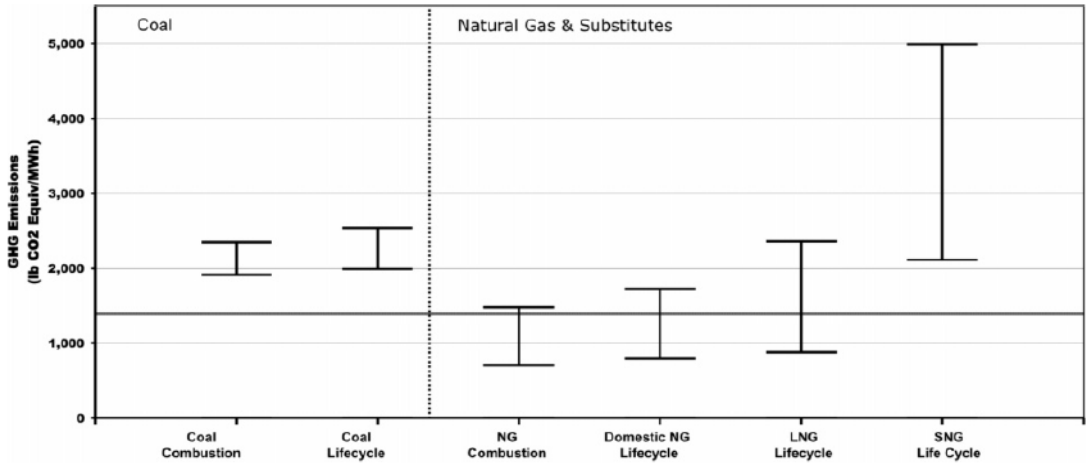
	Pace Report	Jaramillo*
Liquefaction	16.2	18.1 average, range 11.2 to 30.9
Transport	6.4	5.7 average, range 2 to 17
Gasification	0.2	0.9 to 3.7
Total	22.8	24.7 to 27.5

*Note: Jaramillo 2007 and Jaramillo 2005 use identical figures for liquefaction and gasification, but diverge as to transport. Jaramillo 2007 provides the range of transportation emissions given above, which vary according to the export source and import terminal, but no average. Jaramillo Supporting Information at 5. Jaramillo 2005 provides lower estimates for each export route, and uses these estimates to calculate the weighted average presented above.

Neither the Pace Report nor Jaramillo 2007 considered facts particular to Cameron's proposal, or regarding LNG export generally. The emissions associated with transportation of LNG will of course depend on the destination. Jaramillo 2007 concluded that transportation emissions associated with import of LNG from east Asia to Lake Charles, Louisiana (the site of the Cameron facility) would have transportation emissions between 8 and 17 pounds of CO_2e per MMBtu. Jaramillo Supporting Info at 5. Japan and South Korea are the world's largest importers of LNG. If Cameron were to export to these markets, which seems likely, the resulting transportation emissions would therefore likely be double those given on the above table.

Even assuming low transportation emissions, these figures demonstrate that LNG is significantly worse than domestic natural gas in terms of climate emissions. For perspective, natural gas combustion emits roughly 120 pounds of CO_2e per MMBtu. *See, e.g.*, Pace Report at 8, Jaramillo Supporting Info at 9. Using the above conservative figures, the process of liquefying, transporting, and regasifying LNG accordingly emits 19% to 23% of the CO_2e emitted by natural gas combustion itself—a substantial increase. Jaramillo 2007 concluded that this increase could bring LNG's lifecycle greenhouse gas emissions into parity with coal:

Figure 2: Life-Cycle Emissions of LNG, Natural Gas, and Coal in Electricity Generation[105]



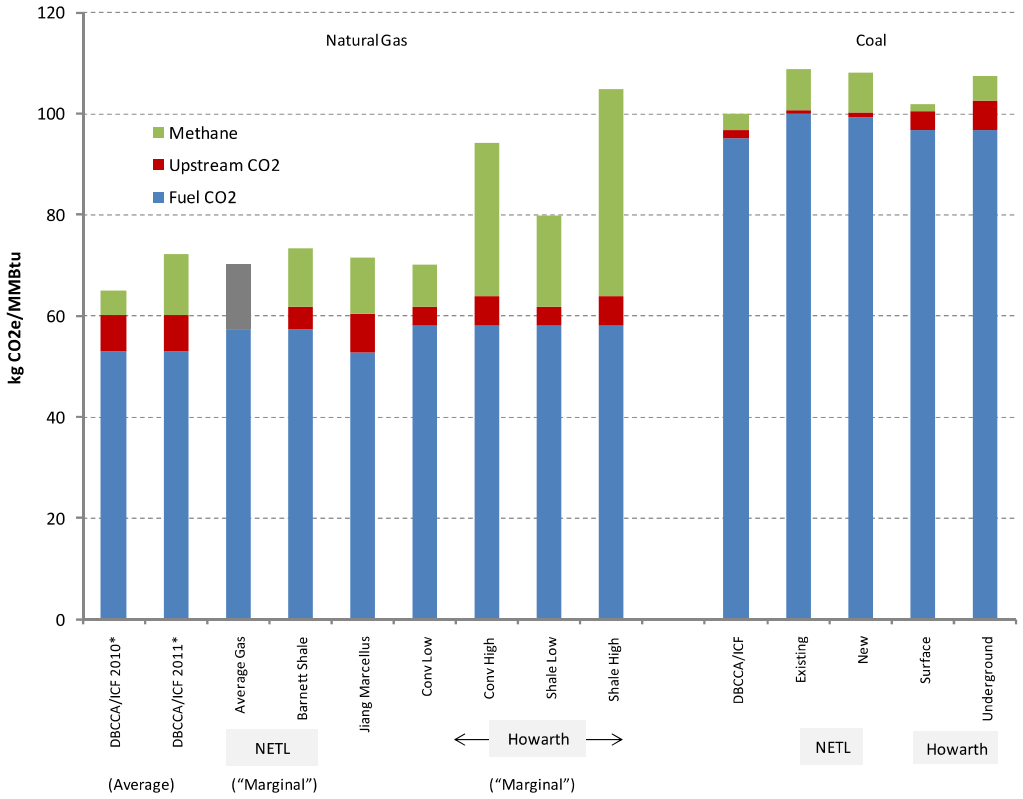
Recent studies have increased estimates of emissions from natural gas production, thereby casting further doubt on any climate advantage to LNG. Both the Pace Report and the Jaramillo studies were conducted prior to shale gas boom. As noted above, shale gas production's methane emissions are drastically higher than those of conventional gas production. Moreover, in April 2011 (well after the Pace Report and Jaramillo studies were published), EPA released improved methodologies for estimating fugitive methane emissions from natural gas systems, which lead to higher estimates. EPA, *Inventory of U.S. Greenhouse Gas Emissions And Sinks: 1990 – 2009,* U.S. EPA, EPA 430-R-11-005.[106]

These recent studies estimate that natural gas production releases at least 44 pounds of CO_2e per MMBtu. A report from the Worldwatch Institute and Deutsche Bank summarizes much of the recent work.[107] Specifically, the Worldwatch Report synthesizes three other reports that used "bottom-up" methodologies to estimate natural gas production emissions, prepared by Dr. Robert Howarth et al., of Cornell,[108] Mohan Jiang et al. of Carnegie-Mellon,[109] and Timothy Skone of NETL.[110] The

[105] From Jaramillo 2007 at 6,295. "SNG," in the figure, refers to synthetic natural gas made from coal.
[106] Available at http://www.epa.gov/climatechange/emissions/downloads11/US-GHG-Inventory-2011-Complete_Report.pdf, and attached as Exhibit 68. The executive summary to this document is Exhibit 13.
[107] Mark Fulton *et al.*, *Comparing Life-Cycle Greenhouse Gas Emissions from Natural Gas and Coal* (Aug. 25, 2011) ("Worldwatch Report"), attached as Exhibit 69.
[108] Robert W. Howarth *et al.*, *Methane and the greenhouse-gas footprint of natural gas from shale formations*, Climactic Change (Mar. 2011), attached as Exhibit 70.
[109] Mohan Jiang *et al.*, *Life cycle greenhouse gas emissions of Marcellus shale gas*, Environ. Res. Letters 6 (Aug. 2011), attached as Exhibit 71.
[110] Timothy J. Skone, *Life Cycle Greenhouse Gas Analysis of Natural Gas Extraction and Delivery in the United States*, Presentation to Cornell (May 12, 2011), attached as Exhibit 72. NETL has also put out a fuller version of this analysis. *See also* Timothy J. Skone, *Life Cycle Greenhouse Gas Inventory of Natural Gas Extraction, Delivery and Electricity Production* (Oct. 24, 2011), attached as Exhibit 73.

Worldwatch Report separately derived a "top-down" estimate, which produced a result similar to the NETL estimate. Worldwatch Report at 9. These various assessments are summarized in the following chart.

Figure 3: Comparison of Recent Life-Cycle Assessments[111]



Source: DBCCA Analysis 2011; NETL 2011; Jiang 2011; Howarth 2011. Note: NETL Average Gas study includes bar shaded grey due to inability to segregate upstream CO2 and methane values, which were both accounted for in the study. See page 10 for more information. *2011 EPA methodology compared to 2010.

As this figure demonstrates, although the 2011 studies differ, they all estimate production greenhouse gas emissions (combined methane and "upstream CO_2") of at least 20 kilograms, or 44 pounds, of CO_2e/MMBtu. *Accord* Worldwatch Report at 15. Moreover, it may be that production emissions are significantly higher.

Jaramillo used much lower production emission estimates, and using higher figures appears to erode what little climate advantage Jaramillo found LNG to have over coal. Jaramillo used estimates of 15.3 to 20.1 pounds CO_2e/ MMBtu, *i.e.*, estimates that were *at least* 24 pounds lower than the 2011 studies'. Jaramillo Supporting Information at 8. Jamarillo estimated total life-cycle emissions for LNG at 149.6 to 192.3 lbs CO_2e/MMBtu. *Id.* Simply increasing these life-cycle estimates by 24 lbs CO_2e represents a 12% to 16%

[111] Worldwatch Report at 3.

increase in total emissions. This increase substantially erodes any climate advantage LNG-fired electricity generation may have over coal-fired generation.

Cameron's production emissions estimate, on the other hand, is an order of magnitude lower than even its contemporary Jaramillo estimate, and over twenty times lower than the low end of the 2011 estimates. The Pace Report uses a production emissions estimate of 1.9 lbs CO_2e/MMBtu to derive a life-cycle estimate of 156 lbs CO_2e/MMBtu for LNG-fired electricity generation. Pace Report at 6, 8. Using an appropriate production emissions estimate increases Pace's life-cycle emission estimates by nearly 30%. This outlandish understatement, coupled with Pace's overestimate of emissions from coal-fired plants,[112] leads to Cameron's surprising assertions regarding the climate benefit of LNG export. Because Cameron's and Pace's estimates are so clearly out of line with the current available science, it would be arbitrary and capricious for DOE/FE to credit Cameron's conclusions.

Finally, the gas production induced by the Cameron Proposal will likely have even higher emissions than those estimated above. The above studies generally estimate gas production emissions in aggregate, mixing conventional gas extraction with unconventional sources such as shale gas. As noted above, the EIA Study predicts that extraction induced by exports will overwhelmingly be from shale gas sources, EIA Study at 11, and shale gas has higher production emissions than conventional sources.[113] This fact highlights the need for a thorough study regarding the indirect and cumulative impacts of export prior to any DOE/FE authorization. Further study is similarly needed to combine the analysis of export on fuel switching domestically with life-cycle emissions of LNG exports. Nonetheless, using even the more conservative estimates in the existing record, it is clear that LNG export will provide little, if any, reduction in global greenhouse gas emissions. DOE/FE must reject Cameron's assertion to the contrary.[114]

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[112] *Compare* Pace Report at 11 with Jaramillo 2007 at 6293, Worldwatch Report at 17.

[113] EPA recently estimated methane emissions from a conventional well completion at only 0.76 tons, while an unconventional well completion yielded 150.6 tons of methane. *See* Exhibit 7at Table 4-6.

[114] Cameron separately asserts that LNG export may produce environmental benefit by displacing oil use. Cameron Application at 27. A recent study examined the climate effects of switching gasoline and diesel fueled vehicles to compressed natural gas, including the emissions from fuel production and transportation. Ramon Alvarez et al., *Greater focus needed on methane leakage from natural gas infrastructure*, Proceedings of the National Academy of Sciences, Early Edition, p. 1 of 6 (2012) (analyzing "well-to-wheels" emissions), available at http://www.pnas.org/cgi/doi/10.1073/pnas.1202407109, and attached as Exhibit 74. This study concluded that "CNG-fueled vehicles are not a viable mitigation strategy for climate change." *Id.* at 2. Converting gasoline-fueled cars to compressed natural gas would make the climate *worse* for 80 years; converting heavy-duty diesel vehicles to natural gas increases warming for 300 years. *Id.*

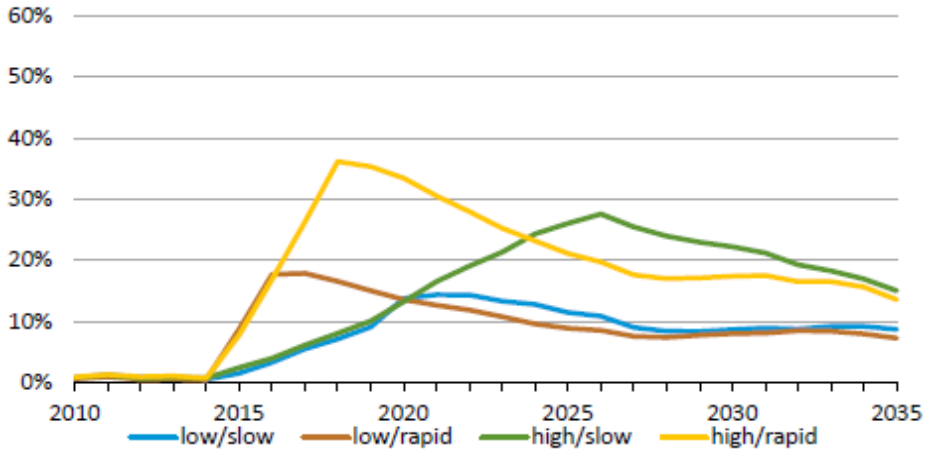
4. Cameron's Proposal Will Cause Economic Harm by Raising Domestic Gas Prices and Eliminating Domestic Jobs

Although Cameron's price projections are purportedly based on the EIA's model, they are contradicted by the EIA itself. Cameron's price arguments rest on a report that uses EIA's "National Energy Modeling System." Cameron Application at 20. The *EIA Study* that DOE/FE itself commissioned, also rests on this system, and predicts that LNG exports will significantly increase demand for natural gas and thereby raise domestic gas prices. *EIA Study* at 6. Higher gas prices will in turn hurt American consumers and limit or eliminate manufacturing and farming jobs, in addition to inflicting the environmental effects described above. *Id.*; Democratic Staff, House Natural Resources Comm., *Drill Here, Sell There, Pay More: The Painful Price of Exporting Natural Gas* (2012) ("*Drill Here, Sell There, Pay More*").[115]

The *EIA Study* predicts striking price increases from a range of export scenarios. EIA considered several combinations of conditions of shale gas export rates and economic circumstances. It considered a "low" export case of 6 bcf/d, phased in either quickly or slowly starting in 2015, and a "high" case of 12 bcf/d, again phased in quickly or slowly. *EIA Study* at 1. Note that even the EIA "high" case represents only three quarters of the 16.1 bcf/d of exports for which applications are presently pending before DOE/FE and FERC. [116] For perspective, note that 16.1 bcf/d is equivalent to 23% of current domestic gas production. EIA, Monthly Natural Gas Gross Production Report (Jan. 30, 2012).[117] The *EIA Study* considered the effects of these exports in the context of four background scenarios: the EIA's Annual Energy Outlook ("AEO") 2011 reference case, cases where shale recoveries were 50% higher or lower than in the reference case, and a high economic growth reference case. *Id.* Models were run from 2015 (the year in which the first exports were presumed to begin) through 2035. *Id.* EIA forecast effects of export on wellhead gas prices, on various gas consumers, and on residential electricity bills. *EIA Study* 6-16. The study summarizes its results for its four export scenarios on the reference economic case as follows:

[115] See Exhibit 4.
[116] *See* http://www.fossil.energy.gov/programs/gasregulation/ LNG_Summary_Table_3_23_12.2.pdf (identifying 14.00 Bcf/d of proposals), Application of Corpus Christi Liquefaction, LLC, FERC docket PF12-3 (FERC pre-filing docket for an additional 2.1 Bcf/d exports not yet included in the DOE/FE summary).
[117] Attached as Exhibit 75.

Figure 4:[118] Natural Gas Wellhead Price Percentage Increases from the AEO 2011 Baseline Under Four Export Scenarios



Lower exports produce wellhead price increases of between 10-20% by 2020, while higher exports can push prices up by just under 40%. If shale gas supplies are more limited, the EIA projects sharper price increases – by over 50% in the high/rapid scenario. *EIA Study* at 9. The increase would presumably be greater still if the full 16.1 bcf/d of proposed export facilities are placed into operation. These wellhead price increases would significantly affect residential, commercial, industrial, and electricity generating users of natural gas. *Id.* at 11, 15. Each type of consumer would respond to increased prices by decreasing consumption. *Id.* Despite decreased consumption, each consumer type would pay a higher total gas bill. Across the 20 year period, residential consumers would face annual gas expenditure increases of 3.2% to 7.0% despite consuming less gas, using EIA's reference case and range of export scenarios. *Id.* at 15. Industrial consumers would pay 6.4% to 14.6% more annually. *Id.*

Importantly, EIA concluded that export volume had a non-linear effect on prices: doubling the export volume more than doubles the price increase. This factor may explain Cameron's assertion that the 1.9 bcf/d demand from its project would increase delivered (c.f. wellhead) prices by only 2.38% in 2020 and 2.18% in 2020 and 2025, respectively. Cameron Application at 20 (citing App. C, Black & Veatch report at 8).[119] The report Cameron submits concedes that it did not consider cases in which demand increased by more than 1.7 bcf/d by 2020, because the DOE 2011 energy outlook the Black and Veatch report is based on did not consider such a scenario. Black & Veatch

[118] From the EIA Study, at 8.

[119] DOE/FE cannot assume that this explains the disparity, however. Insofar as the EIA Study is commissioned by DOE/FE specifically to impartially address the question of export's price impacts, it would be arbitrary and capricious for DOE/FE to rely on an industry study without evidence demonstrating that the latter was consistent with, or somehow superior to, the EIA Study.

report at 9. It may be that, if Cameron's project constituted the *only* increase in domestic demand by 2020, the project would only increase prices by 2.38%.[120] DOE/FE must evaluate the public interest, however, in the context of other reasonably foreseeable developments.

DOE/FE's public interest analysis must evaluate the overall and cumulative impacts of export, rather than narrowly focusing on an individual proposal. The EIA Study began this effort, although it failed to consider the full volume of proposed exports. The public, after all, will not experience each proposed terminal as an individual project: It will experience them cumulatively, through the gas and electricity prices that they will raise and the environmental damage that they will cause. Therefore, to determine whether any one export proposal is consistent with the public interest, DOE/FE must consider whether a given proposal will harm the public in concert with (a) all proposals which have already been approved and (b) whether it will cause harm if all reasonably foreseeable proposals were approved. If the answer to this second question is yes, DOE/FE must be able to justify why it is still in the public interest to approve the project before it.

The *EIA Study* indicates that Cameron's proposal will, in conjunction with other proposed exports, lead to price increases that will harm residential consumers and limit manufacturing jobs. The *EIA Study* explains that:

> Even while consuming less, on average, consumers will see an increase in their natural gas and electricity expenditures. On average, from 2015 to 2035, natural gas bills paid by end-use consumers in the residential, commercial, and industrial sectors combined increase 3 to 9 percent over a comparable baseline case with no exports, depending on the export scenario and case, while increases in electricity bulls paid by end-use customers range from 1 to 3 percent. In the rapid growth cases, the increase is notably greater in the early years relative to the later years. The slower export growth cases tend to show natural gas bills increasing more towards the end of the projection period.

[120] Sierra Club does not concede this point. Another export applicant recently estimated that exporting 2.2 bcf/d would increase prices by 5-6%. Dominion Cove Point LNG, LP, *Application for Long-Term Authorization to Export Liquefied Natural Gas to Non-Free Trade Agreement Countries*, DOE/FE Docket 11-128-LNG, Ex. D at 42 (Oct. 3, 2011), available at http://www.fossil.energy.gov/programs/gasregulation/11-128-LNG.pdf, and attached as Exhibit 76. Nor does Sierra Club contend that a 2% increase in delivered gas prices is insignificant.

EIA Study at 6. These percentage increases are very large in absolute terms. In the low/slow scenario, gas and electricity bills increase by $9 billion *per year*, and this increase grows to $20 billion per year in other scenarios. *EIA Study* at 14. Industries particularly dependent on natural gas—such as farming, steel production, fertilizer manufacturing, and chemical manufacturing—will all be particularly impacted by these increases. *Drill Here, Sell There, Pay More* at 9-13. Increased costs to these industries will likely result job losses, or at least stymied job growth, offsetting job growth exports would create in the natural gas production industry. *Id.*

5. The Economic Benefits Cameron Predicts are Uncertain and Overstated

Cameron's claims of economic benefit rest on an "Economic Impact Assessment" that uses an outdated methodology that drastically overstates the likely economic benefits. Cameron claims that its export proposal will "generate" billions of dollars in economic benefits and an average of 53,000 jobs per year during its twenty-year operation. Cameron Application at 23. Only 65 persons, however, will be permanently employed by the facility itself. *Id.* at App. D p. 8 ("Economic Impact Assessment"). Cameron's economic benefit argument therefore rests on predictions of temporary construction jobs, jobs in the gas production industry and, importantly, jobs in other sectors supported by gas production activity.

The predictions wither under scrutiny. Cameron's argument rests entirely on analyses using the "input-output" models to calculate economic benefits. As we explain below, the analyses Cameron cites fail to present adequate counterfactuals, overstate spending, and overstate the benefit of spending that does occur. Analysis of the economic effects of the shale gas boom using empirical data, rather than simplistic models, reveals that the benefits are much smaller than Cameron asserts.

a. Limits of Cameron's Economic Analysis

Cameron's economic estimates are based on an "input-output" economic model, presumably IMPLAN. To use an input-output model, the user inputs a description of economic activity in a given set of economic sectors, and the model responds by tracing this spending through the economy. Specifically, the model uses accounting tables to track how the initial expenditure will flow through various industrial sectors and then uses local multipliers to estimate how this allocation will alter employment decisions. Here, Cameron used Louisiana specific multipliers and argued that its results were consistent with those reached in Pennsylvania and West Virginia studies of shale gas extraction. Economic Impact Analysis at 7-8, Cameron Application at 23, 23 n.51.[121] The

[121] Citing, *inter alia*, Considine, Timothy J., *The Economic Impacts of the Marcellus Shale: Implications for New York, Pennsylvania and West Virginia*, A REPORT TO THE AMERICAN PETROLEUM INSTITUTE (2010) ("Considine 2010"); Timothy Considine et al., *An Emerging Giant: Prospects and Economic Impacts of Developing the Marcellus Shale Natural Gas Play*, THE PENN. STATE UNIV. DEP'T OF ENERGY & MINERAL ENG'G, 18-

Economic Impact Analysis then took the amount to be spent on, for example, gas production, applied one multiplier to determine the economic benefit that spending would purportedly stimulate in the broader economy, and then applied a second multiplier to determine the number of jobs supported per million dollars spent. *See, e.g.,* Economic Impact Assessment at 9.

Input-output models like the one used here suffer numerous significant limitations. A recent study by Amanda Weinstein and Dr. Mark Partridge, of Ohio State University, explains why many of these limitations matter in the shale gas context. *See* Amanda Weinstein and Mark D. Partridge, *The Economic Value of Shale Natural Gas in Ohio*, OHIO STATE UNIVERSITY, Swank Program in Rural-Urban Policy Summary and Report (December 2010) ("*Ohio Study*").[122] Further limitations are discussed by David Kay, *The Economic Impacts of Marcellus Shale Gas Drilling: What Have We Learned? What are the Limitations?* (Apr. 2011).[123]

First, the analysis does not consider counterfactuals and foregone opportunities. It maps the consequences of a particular expenditure, rather than asking how the economy might have grown had investors and regulators made different choices. Nor does it consider how the particular choice at issue might displace other economic activity. The absence of a counter-factual is at the core of the Ohio Study's critique. *Id.* at 11. As the Ohio Study explains:

> Impact analysis [of the sort that IMPLAN conducts] is usually based on an old input-output technology that is typically not used today by economists to estimate actual economic effects. Impact studies do not include various displacement effects and do not reflect the true counterfactual of comparing what would have happened without natural gas drilling. For example, oil and natural gas drilling would lead to higher local wages and land costs, which reduce employment that would have occurred elsewhere in the economy. Likewise, the environmental effects may reduce activity in the tourism sector and other residents may not want to live near such degrading activity. Finally, greater natural gas employment means that there are fewer jobs in coal that would have occurred without the increase in natural gas employment.

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19 (2009) ("Considine 2009"); and National Energy Technology Laboratory, *Projecting the Economic Impact of Marcellus Shale Gas Development in West Virginia*, at 20 (2010) ("West Virginia study").

[122] Attached as Exhibit 77. Of particular note here, many of the examples of problems the Ohio Study provides are drawn from the Considine reports Cameron relies on in its application.

[123] Attached as Exhibit 78.

Id. (emphasis in original).

Second, input-output studies may not reflect actual spending patterns, as the Ohio Study explains. *Id.* at 14-15. For example, landowners given gas production leases may choose to save their money, rather than to spend it. *Id.* Unlike some other studies, Considine 2010 does not mention individual saving rates.

Third, these studies are static, providing a series of one-year snapshots. Cameron's study measures "job-years" but not jobs held year to year. As the Ohio Study explains,

> impact studies do not produce continuous employment numbers. If an impact study says there are 200,000 jobs, this does not mean 200,000 workers are continuously employed on a permanent basis. For example, there are workers that do site preparation. Then there is another group who do the drilling followed by another group who maintains the well when it is in production. Finally, there is an entirely different group doing pipeline construction, and so on. So, while the public is likely more interested in continuous ongoing employment effects, impact studies are producing total numbers of supported jobs that occur in a more piecemeal fashion.

Ohio Study at 11.

Fourth, input-output studies cannot determine how many jobs are created. The model identifies the number of jobs supported by the predicted spending. *Id.* Job support cannot be treated as job creation without consideration of a counterfactual, however, because absent a counterfactual, it is impossible to determine whether the job would have existed anyway, without the project under consideration. *Id.* This flaw is particularly apparent here, because Cameron's Economic Impact Analysis claims that the project will "generate" jobs associated with 1.9 bcf/d of gas production throughout each of the 20 years of the plant's authorization, Economic Impact Analysis at 8, but Cameron's price analysis concludes that much of this production would have occurred without the project. Specifically, after discussing on-site construction and operations jobs, Cameron asserts that "[a]n even greater number of jobs, and far greater overall economic benefits, will result from the exploration and production of the 1.9 Bcfd of gas required for the Project. Some 4,600 jobs are expected in the gas industry." Cameron Application at 23. Cameron's price impact report predicts that the project will only

induce an additional 1.232 bcf/d of production by 2020, and only 1.51 bcf/d of production by the end of the project in 2035. Cameron Application App. C at 8.[124]

Fifth, as a result of the above limitations, an input-output model is not readily able to "evaluate economic circumstances in which the change in the economy has been or will be rapid and large," or to deal with the complicated series of individual choices and community disruptions (including the displacement of existing economic activity) occasioned by the boom. David Kay, *The Economic Impacts of Marcellus Shale Gas Drilling: What Have We Learned? What are the Limitations?*, 5-6, 22-30 (Apr. 2011).[125] Input-output models struggle, particularly, to map these distributional effects, where some prosper while others suffer, and, more generally, are not designed to chart the long-term effects of such major dislocations. *See id.* at 22-30.

In summary, Cameron's economic predictions, which are based on an input-output model, should be seen as estimates of solely the effects of increased expenditures on a particular project (here, gas exports and production), and limited and overly-optimistic ones at that, rather than as a reliable comparison of how the economy would fare with and without gas exports. The Natural Gas Act's "public interest" test requires DOE/FE to determine whether the country would be better off with Cameron's proposal than without it. An input-output based analysis cannot answer this question, but this is the only analysis Cameron offers.

b. Empirical Analysis Reveals Much Less Economic Benefit and Offsetting Economic Harm

Available empirical data shows that the real economic effects of increasing gas production are far more limited and equivocal than Cameron claims. The Ohio Study works to describe these effects by analyzing the counterfactual that Cameron's results lack. It begins by noting that Pennsylvania, the center of the shale gas boom, does not appear to be creating nearly as many jobs as industry claims suggest. Bureau of Labor Statistics for 2004-2010 show that *all* oil and gas sector jobs (not just those in shale gas, or those drilling new wells), increased by only about 10,000 in the state over that period. Ohio Study at 12.

The study went further, using Bureau of Economics Analysis statistics to directly compare employment and income in counties in Pennsylvania with significant Marcellus drilling and those without significant drilling, before after the boom started. As Table 1, below, shows, counties in both areas *lost* jobs during the boom (after 2005)—and, though that result is reasonable considering the economic downturn in those years, it is

[124] Presumably the remainder of Cameron's needs will be met by existing supplies made available when existing purchasers decline to pay the increased prices that will result from export.
[125] See Exhibit 78.

striking that drilling counties declined at a slightly *faster* rate in that period, though per capita income also increased more quickly in those counties.

Table 1: Comparing Pennsylvania Counties, With and Without Drilling, Over Time[126]

	Employment Growth Rate 2001-2005	**Employment Growth Rate 2005-2009**	**Income Growth Rate 2001-2005**	**Income Growth Rate 2005-2009**
Drilling Counties	1.4%	-0.6%	12.8%	18.2%
Non-Drilling Counties	5.3%	-0.4%	12.6%	13.6%

The jobs effect, in either direction, turns out to be too small to be statistically significant. *Id.* at 16. This is not a surprising pattern: Incomes likely rise thanks to lease payments to some landowners, and some degree of hiring for high-income production decisions, but extraction displaces other workers, or jobs go to out-of-state workers rather than to residents who likely lack industry experience. *See id.*

A set of more detailed studies from Cornell University's Department of City and Regional Planning largely confirm this pattern. Those researchers spent more than a year studying the economic impacts of the gas boom on Pennsylvania and New York. Their core conclusion is that boom-bust cycle inherent in gas extraction makes employment benefits tenuous, and may leave some regions hurting if they are unable to convert the temporary boom into permanent growth. As the researchers put it:

> The extraction of non-renewable natural resources such as natural gas is characterized by a "boom-bust" cycle in which a rapid increase in economic activity is followed by a rapid decrease. The rapid increase occurs when drilling crews and other gas-related businesses move into a region to extract the resource. During this period, the local population grows and jobs in construction, retail and services increase, though because the natural gas extraction industry is capital rather than labor intensive, drilling activity itself will produce relatively few jobs for locals. Costs to communities also rise significantly, for everything from road maintenance and public safety to schools. When drilling ceases because the commercially recoverable resource is depleted, there is an economic

[126] Adapted from Table 1 of the *Ohio Study* at 15.

> "bust" – population and jobs depart the region, and fewer people are left to support the boomtown infrastructure.

Susan Cristopherson, CaRDI Reports, *The Economic Consequences of Marcellus Shale Gas Extraction: Key Issues* ("*Cornell Study*") (Sept. 2011) at 4.[127] This boom and bust cycle is exacerbated by the purportedly vast resources of the Marcellus play, because regional impacts will persist long after local benefits have dissipated, as the authors explain, and may be destructive if communities are not able to plan for, and capture, the benefits of industrialization:

> [B]ecause the Marcellus Play is large and geologically complex, the play as a whole is likely to have natural gas drilling and production over an extended period of time. While individual counties and municipalities within the region experience short-term booms and busts, the region as a whole will be industrialized to support drilling activity, and the storage and transportation of natural gas, for years to come. Counties where drilling-related revenues were never realized or could have ended may still be impacted by this <u>regional</u> industrialization: truck traffic, gas storage facilities, compressor plants, and pipelines. The cumulative effect of these seemingly contradictory impacts – a series of localized short-term boom-bust cycles coupled with regional long-term industrialization of life and landscape – needs to be taken into account when anticipating what shale gas extraction will do communities, their revenues, and the regional labor market, as well as to the environment.

Id. (emphasis in original). The benefits of gas development are, in other words, not smoothly distributed, in space or in time. Some people will prosper and some will not during the resultant disruption and, warn the Cornell researchers, the long-term effects may well not be positive, based upon years of research on the development of regions dependent on resource extraction:

> [T]he experience of many economies based on extractive industries warns us that short-term gains frequently fail to translate into lasting, community-wide economic development. *Most alarmingly, a growing body of credible research evidence in recent decades shows that resource dependent communities can and often do end up worse*

[127] Attached as Exhibit 79.

> *than they would have been without exploiting their extractive reserve.* When the economic waters recede, the flotsam left behind can look more like the aftermath of a flood than of a rising tide.

Id. at 6 (emphasis supplied).

The researchers also outline many of the challenges communities face as they attempt to benefit from natural gas development. Most obviously, it is difficult to convert technical natural gas field jobs directly into sustainable, well-paying local employment. *See* Jeffrey Jacquet, *Workforce Development Challenges in the Natural Gas Industry* (Feb. 2011).[128] This is in part because the industry's employment patterns are uneven: the researchers cite Pennsylvania employment data showing that "*the drilling phase accounted for over 98% of the natural gas industry workforce* engaged at the drilling site," and complementary Wyoming data showing a similar drop-off. *Id.* at 4 (emphasis in original). As a result, drilling jobs correspond to the boom and bust cycle inherent to resource extraction industries. *Id.* The remaining, small, percentage of production phase and office jobs are far more predictable, *id.* at 4-5, but need to filled with reasonably experienced workers, *id.* at 12-14. Although job training at the local level can help residents compete, the initial employment burst is usually made up for people from out of the region moving in and out of job sites; indeed, "[t]he gas industry consistently battles one of the highest employee turnover problems of any industrial sector." *Id.* at 13.

Meanwhile, communities also confront a panoply of development issues, ranging from coping with sudden population increases, major road damage from drilling operations, damage to the tourism industry, and a host of environmental risks (discussed in more detail below). *See, e.g.*, CJ Randall, *Hammer Down: A Guide to Protecting Local Roads Impacted by Shale Gas Drilling* (Dec. 2010)[129]; Susan Riha & Brian G. Rahm, *Framework for Assessing Water Resource Impacts from Shale Gas Drilling* (Dec. 2010)[130]; *Cornell Study* at 8).

These tourism threats are particularly concerning for many parts of Marcellus region, including New York's Southern Tier, because tourism is a major source of income and employer. In the Southern Tier, according to one recent study, the industry directly accounts for $66 million in direct labor income, and 4.7% of all jobs, and supports 6.7% of the region's employment. Andrew Rumbach, *Natural Gas Drilling in the Marcellus Shale: Potential Impacts on the Tourism Economy of the Southern Tier* (2011).[131]

[128] Attached as Exhibit 80.
[129] Attached as Exhibit 81.
[130] Attached as Exhibit 82.
[131] Attached as Exhibit 83.

Although the study concludes that the near-term economic impact of gas drilling would likely be positive, it identifies two "major caveats" – that the monetary value of the gas industry underestimates its disruption to the region's stability and way of life, and that gas drilling benefits "will be relatively short-term and non-local." *Id.*at 9. Once again, simple arguments for the raw economic benefits of gas extraction's benefits turn out to conceal complex social and economic consequences, and a complicated mix between benefits and costs in each particular place the industry affects.

The point of all this, of course, is that a simple economic model, like the input-output model Cameron offers here, cannot reliably capture the consequences of transforming an entire region of the country, converting it from a largely rural swath of small towns, farms, and forests into an industrial gas extraction zone. That transformation will benefit some discrete actors considerably, and some communities, if they are able to navigate the durable challenges of boom and bust economics. But it will also harm people, by displacing existing businesses and lifeways, straining infrastructure, shifting populations, and, potentially, leading to devastating economic crashes in some areas.

6. DOE/FE Cannot Rationally Approve Cameron's Export Plan On the Record Before It

The Natural Gas Act, and subsequent DOE delegation orders and regulations, charge DOE/FE with determining whether or not a gas export application is in the public interest. *See, e.g.* 15 U.S.C. § 717b(a). DOE/FE must make this decision on the record before it. This means that, regardless of DOE/FE's decision to presume, initially, that an application should be granted, this presumption does not, and cannot, absolve DOE/FE of its duty to make its *own* determination. *Panhandle Producers and Royalty Owners Ass'n*, 822 F.2d at 1110-1111. Simply put, "the *agency* must examine the relevant data and articulate a satisfactory explanation for its action including a rational connection between the facts found and the choice made." *Motor Vehicle Mfrs. Ass'n of the United States v. State Farm Mut. Auto. Ins. Co.*, 463 U.S. 29, 43 (1983) (emphasis supplied). DOE/FE cannot rationally find for CAMERON on the record in this case.

As we have demonstrated, record support for Cameron's claimed benefits is extraordinarily thin. Cameron has submitted an input-output model argument of economic benefit, but the underlying model does not show whether the economy would improve *more* without Cameron's proposal than it would without it, nor address the many costs and displacement effects associated with natural gas booms. Cameron further argues that export will not cause gas price increases, but this argument is contradicted by the *EIA Study* that DOE/FE itself commissioned.

Sierra Club, on the other hand, has shown that the gas and electricity price increases associated with exports will add billions of dollars in costs to the consumers. These costs will propagate through the economy, retarding growth. Sierra Club has also shown that the economic benefits, if any, associated with gas production increases may actually do

long-term damage to the U.S. economy by plunging large regions of the country into a boom-and-bust extractive cycle. Further, Sierra Club has shown that gas extraction and export have major environmental (and, hence, additional economic) costs, which CAMERON has failed to even acknowledge.

On this record, DOE/FE cannot approve export. Were it do so, it would be violating basic norms of agency record rulemaking, as well as its own rules. *See, e.g.*, 5 U.S.C. § 706; 10 C.F.R. § 590.404 (requiring DOE/FE to base its final opinion "solely on the official record of the proceeding" and to impose terms "as may be required by the public interest" after record review).

In this case, this record review data requires that DOE/FE play particularly close regard to both the positive and negative impacts of gas export and extraction. Cameron's application discusses only the purported benefits of its proposal, casting a wide net in hopes of capturing indirect and induced economic activity, while failing to recognize the environmental and economic costs of that same activity. If DOE/FE were to consider the benefits of increased gas production without also considering the costs, it would have "entirely failed to consider an important aspect of the problem, [or] offered an explanation for its decision that runs counter to the evidence before the agency. *State Farm*, 463 U.S. at 43. It must not do so.

At bottom, the decision to export U.S. gas resources is a major public policy decision and must, by law, be made with extraordinary care. DOE/FE cannot justify moving forward on the scanty and incomplete record before it.

C. DOE/FE Must Not Approve Cameron's Export Plan Without a Proper NEPA Analysis

As we have demonstrated, DOE/FE can – and indeed must – ground its decision upon a full consideration of the environmental impacts of gas export and extraction. The NEPA process must be "coordinate[d] with its decisionmaking," 10C.F.R. § 1021.210, and can usefully inform it. Indeed, because approval of a gas export application is a major federal action which may significantly affect the environment, DOE/FE is barred from moving forward without a full EIS. Sierra Club therefore protests this application to the extent that DOE/FE grants either a conditional or a full approval without the completion of a full and legal EIS and Record of Decision which support its decision.

1. DOE/FE Must Fully Analyze the Direct, Indirect, and Cumulative Impacts of Increased Gas Production Linked to Gas Exports from Freeport

As we have explained, Cameron rests its public interest claims on its claimed ability to stimulate enhanced natural gas production. Environmental impacts of this increased production, including "growth inducing effects," are thus manifestly "reasonably foreseeable" indirect effects of Cameron's proposal. *See* 40 C.F.R. § 1508.8. These

effects will be added to the effects of gas production (and other environmental burdens from other industries) already present in the gas plays which Cameron affects, along with any induced production associated with other export proposals. DOE/FE must fully describe all of these effects and develop alternatives which would avoid them, including the alternative of denying Cameron's application, limiting exports to a smaller quantity, or imposing environmental controls on gas produced for export.[132]

Although this requirement is clear on the face of the statute and binding regulations, it is also clear on the NEPA case law. As the Ninth Circuit Court of Appeals recently explained:

> Because "NEPA places upon an agency the obligation to consider every significant aspect of the environmental impact of a proposed action," *Vt. Yankee Nuclear Power Corp. v. Natural Res. Def. Council*, 435 U.S. 519, 553, 98 S.Ct. 1197, 55 L.Ed.2d 460 (1978), the considerations made relevant by the substantive statute driving the proposed action must be addressed in NEPA analysis.

Oregon Natural Desert Ass'n v. Bureau of Land Management, 625 F.3d 1092, 1109 (9th Cir. 2010). DOE/FE is determining whether or not gas exports are in the "public interest," a term which the Supreme Court has repeatedly held includes consideration of environmental impacts. *Nat'l Ass'n for the Advancement of Colored People v. Federal Power Commission*, 425 U.S.at 670 n.4; *Udall v. Federal Power Comm'n*, 387 U.S. at 450. Thus, just as DOE/FE must consider upstream environmental impacts in its Natural Gas Act determination, so, too, it must analyze and disclose these impacts in the NEPA analysis that will support its final determination.

Thus, infrastructure projects, like Cameron's proposal, that enable resource extraction activities to expand upstream naturally must fully analyze those impacts in the NEPA framework. In *Northern Plains Resource Council v. Surface Transportation Board*, - F.3d -, 2011 WL 6826409, for instance, the Court considered a railway line which was developed in order to expand coal production at several mines. *Id.* at *10. It held that the Surface Transportation Board's NEPA analysis for the line was illegal because the Board had refused to consider the mines' impacts. The Court held that such impacts were plainly "reasonably foreseeable" – and, indeed, were the premise for the construction project in the first place. *Id.* They therefore had to be considered in the NEPA analysis.

[132] Thus, the EIS must address each of the many impacts we have discussed above. Likewise, appropriate ESA and NHPA analysis must address these impacts as they bear upon ESA- and NHPA-protected resources.

The same analysis applies here. Upstream gas production provides the justification for Cameron's proposal – because gas is being produced in historically large quantities, Cameron argues that export is appropriate, and important to stabilize and enhance gas production – and is a reasonably foreseeable result of Cameron's exports. Indeed, Cameron has been at pains to demonstrate that such production will occur. DOE/FE must therefore fully account for this production in an EIS for its decision.

Notably, DOE/FE has failed to do so in the past. As we observed in our comments on the Sabine Pass facility's Environmental Assessment (EA),[133] FERC, the lead agency on that EA, failed even to acknowledge the upstream impacts of the facility. Although DOE/FE may again allow FERC to take lead agency status, it may not move forward unless either it or FERC completes an adequate EIS that *does* cover all upstream impacts of DOE/FE's decision. Because FERC is, instead, focused on the environmental consequences of facility siting, DOE/FE make clear to FERC that this upstream consideration *must* be included in a full EIS for the Freeport project.

2. DOE/FE May Not Conditionally Approve Cameron's Proposal Without a Full EIS

It is true that, as a general matter, DOE/FE may issue "conditional" orders, *see* 10 C.F.R. § 590.402, but this general authority cannot trump DOE's specific rules barring the agency from taking any "action concerning [a] proposal" that is the subject of an EIS, 10 C.F.R. § 1021.211, if that action tends to "limit the choice of reasonable alternatives," or "tend[] to determine subsequent development ." 40 C.F.R. § 1506.1. A conditional approval limits alternatives, and determines subsequent choices, in precisely this forbidden way.

The Sabine Pass EA and DOE/FE conditional approval in that case provide a good example of this problem. In *Sabine Pass*, DOE/FE expressed its "conditional" view that the project was in the public interest, conditioned on "the satisfactory completion of the environmental review process [by FERC] and on issuance by DOE/FE of a finding of no significant impact or a record of decision pursuant to NEPA." *Sabine Pass* at 41.

This decision was, first, irrational: As we have discussed at length above, DOE/FE cannot complete a public interest determination without weighing environmental factors. Because these factors are integral to DOE/FE's decision, and NEPA is purely procedural statute, DOE/FE must weigh environmental interests at the same time that weighs all other interests. It may not parcel them into a separate process without irrationally ignoring required statutory factors and important aspects of the problem before it on the record.

[133] Attached as Exhibit 84. We incorporate those comments in full by reference.

Second, DOE/FE's approval, even if nominally "conditional," plainly influenced the NEPA process. In the Sabine Pass EA, although FERC acknowledged that DOE/FE was making a broad public interest determination, FERC functionally treated DOE/FE's decision as already made. As such, in its alternatives analysis, FERC summarily rejected the "no-action" alternative because "the no-action alternative could not meet the purpose and need for the Project." Sabine Pass EA at 3-1. This statement is incoherent, if FERC truly understood DOE/FE not to have made a decision. DOE/FE is, after all, considering *whether* to allow gas exports. Because that decision has *not* been made, it is wholly appropriate to selected a "no-action" alternative (including, for FERC, a decision not site a facility whose exports have not been permitted). The fact that FERC felt that it was not free to do so indicates that conditional approvals in fact tend to limit alternatives and steer the development decisionmaking process.

To avoid this illegal effect, DOE/FE therefore may not approve the CAMERON export proposal, conditionally or not, until it has considered all alternatives to doing so through the NEPA and Natural Gas Act processes.

3. DOE/FE Must Consider an Adequate Range of Alternatives

Both NEPA and the Natural Gas Act require full consideration of alternatives to Sabine Pass's proposal. Specifically, the public interest analysis requires an "exploration of all issues relevant to the 'public interest'," an inquiry which the Supreme Court held in *Udall* must be wide-ranging. In that case, which concerned hydropower, the regulatory agency was required to consider, for instance, "alternate sources of power," the state of the power market generally, and options to mitigate impacts on wildlife. Here, likewise, DOE/FE must consider alternatives to the export proposal which would better serve the public interest, broadly analyzing other approaches to structuring LNG exports and gas use generally, given exports' sweeping effects on the economy.

NEPA is designed to support this sort of broad consideration. The alternatives analysis is "the heart of the environmental impact statement," presenting sharply defined issues which offer "clear basis for choice among options by the decisionmaker and the public." 40 C.F.R. § 1502.14. Crucially, the alternatives must include "reasonable alternatives not within the jurisdiction of the lead agency," – meaning that DOE/FE must review actions which it cannot directly order – and must include "appropriate mitigation measures not already included in the proposed action or alternatives." *Id.* Because alternatives are so central to decisionmaking and mitigation, "the existence of a viable but unexamined alternative renders an environmental impact statement inadequate." Oregon Natural Desert Ass'n, 625 F.3d at 1122 (internal alterations and citations omitted).

Because DOE is considering the impacts of exports on the public interest, it must look much more broadly than facility-level siting alternatives, as *Udall* indicates, and FERC's bare three alternatives which consider this question somewhat more broadly are not

sufficient. Notably, DOE/FE must seriously consider a "no action" alternative, because the question before DOE/FE is precisely whether export, and the increased production it would cause, is in the public interest. Thus, DOE/FE must consider the ramifications of denying export in detail, rather than simply dismiss that possibility.

More fully, DOE/FE must consider a wide range of alternatives that relate specifically to its broad public interest mandate. Without limiting this consideration, these alternatives should include, at a minimum, consideration of the following:

> (1) Whether, consistent with the EIA study, exports, if allowed, should move forward in smaller quantities or a slower time table to mitigate the domestic economic and environmental impacts associated with large export volumes or rapid export schedules;
>
> (2) Whether export from other locations would better serve the public interest by mitigating economic or environmental impacts or by limiting the cumulative impacts of multiple terminals located in one region (i.e., the Gulf Coast);
>
> (3) Whether limitations on the sources of exported gas – e.g., limiting export from particular plays, formations, or regions – would help to mitigate environmental and economic impacts;
>
> (4) Whether to condition export on the presence of an adequate regulatory framework, including the fulfillment of the recommendations for safe production made by the DOE's Shale Gas Subcommittee, would better serve the public interest by ensuring that the production increases associated with export will not increase poorly-regulated unconventional gas production;
>
> (5) Whether to delay, deny, or condition exports based upon their effect on the U.S. utility market (including changes in air pollution emissions associated with the impacts of increased export demand on fuel choice);
>
> (6) Whether to require exporters to certify that any unconventional gas produced as a result of their proposal (or shipped through their facilities) has been produced in accordance with all relevant environmental laws and according to a set of best production practices (such as that discussed by the DOE's Shale Gas Subcommittee);
>
> (7) Whether to deny export proposals all together as contrary to the public interest.

Other alternatives are, no doubt, also available, but DOE/FE must, at a minimum, consider the possibilities listed above, as they are reasonable and bear directly on the public interest determination before it.

4. A Programmatic EIS is Appropriate

Finally, we again emphasize that the Cameron proposal is only one of many before DOE/FE. Because the effects of these projects are cumulative, and because each approval alters the price and production effects of exports on the economy, DOE/FE must consider these projects' interactions.

It can best do so by conducting a programmatic EIS considering the impacts of *all* gas export proposals at once. DOE/FE has the discretion to do so, even if it determines that it does not have the duty to do so. *See* 40 C.F.R. § 1508.17(b)(3); *see also* 10 C.F.R. § 1021.330. Such a programmatic EIS would allow DOE/FE, and the public, to understand the impacts of all of these proposals, their interactions, and their cumulative environmental and economic impacts. That understanding would serve improved decisionmaking, and allow DOE/FE, the public, and industry, to identify prudent alternatives to serve the public interest and minimize environmental impacts.

Programmatic EISs are designed to serve precisely this purpose. Rather than proceeding in a piecemeal fashion, DOE/FE must recognize that it is making what is, functionally, a programmatic decision to radically alter the U.S. market and production system by allowing for large-scale LNG export, and conduct an EIS commensurate with the decision it is making, rather than piece-mealing that decision from application to application.

D. If DOE/FE Does Move Forward, It Must Impose Rigorous Monitoring Conditions

If DOE/FE nonetheless approves Cameron's application, it must recognize its continuing duty to protect the public interest, as it explained in its *Sabine Pass* decision. This duty is of crucial importance in the context of LNG export, where circumstances are rapidly changing. DOE/FE therefore announced its intention to monitor environmental, economic, and other relevant considerations. *Sabine Pass* at 31-33. Such a monitoring provision must be imposed here, as well, but must be significantly expanded.

Specifically, although *Sabine Pass* announces an intention to monitor many different considerations, it most clearly states that the agency will act if there is a "reduction in the supply of natural gas needed to meet essential domestic needs." *Id.* at 32. This consideration is undoubtedly of great importance, but it is not the only way in which changing circumstances could imperil the public interest.

On the contrary, as we have demonstrated at length in these comments, there is strong evidence that the public interest will be impaired by gas exports. These impairments include (1) regional and national economic dislocations and disruptions caused by

natural gas extraction, including by the industry's boom-and-bust cycle, (2) national increases in gas and electricity prices and resulting shifts to more polluting fuels, (3) and environmental impacts of many sorts. Any one of these categories of interests could be impaired by gas export. DOE/FE must therefore state that it will monitor each of these areas, providing specific monitoring terms and thresholds which will trigger agency actions of various types, ranging from further study through reductions in export volume or changes in timing to a revocation of DOE/FE's approval.[134]

If DOE/FE fails to include such provisions in any final approval, it will fail to fulfill its "continuing duty to protect the public interest," *id.* at 31, and so violate the Natural Gas Act. Because neither Cameron nor DOE/FE have described or proposed such terms, Sierra Club also protests this application to the extent that DOE/FE fails to develop adequate monitoring terms of the sort we have described.

IV. Conclusion

Sierra Club therefore moves to intervene, offers the above comments, and protests Cameron's export proposal for the reasons described above. Cameron's application is not consistent with the public interest and must be denied.

Respectfully submitted,

Nathan Matthews
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[134] Providing a clear monitoring plan of this sort will also benefit Cameron, which will be better able to determine when and how DOE/FE may act, improving the company's ability to plan its actions and investments.

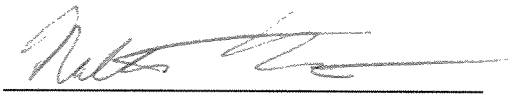
UNITED STATES OF AMERICA
DEPARTMENT OF ENERGY
OFFICE OF FOSSIL ENERGY

IN THE MATTER OF	)	
	)	**FE DOCKET NO. 11-162-LNG**
Cameron LNG, LLC	)	
	)	

CERTIFICATE OF SERVICE

I hereby certify that I caused the above documents to be served on the applicant and all others parties in this docket, in accordance with 10 C.F.R. § 590.017, on April 23, 2012.

Dated at San Francisco, CA, this 23rd day of April, 2012.



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UNITED STATES OF AMERICA
DEPARTMENT OF ENERGY
OFFICE OF FOSSIL ENERGY

IN THE MATTER OF	)	
	)	**FE DOCKET NO. 11-162-LNG**
Cameron LNG, LLC	)	
	)	

CERTIFIED STATEMENT OF AUTHORIZED REPRESENTATIVE

Pursuant to C.F.R. § 590.103(b), I, Nathan Matthews, hereby certify that I am a duly authorized representative of the Sierra Club, and that I am authorized to sign and file with the Department of Energy, Office of Fossil Energy, on behalf of the Sierra Club, the foregoing documents and in the above captioned proceeding.

Dated at San Francisco, CA, this 23rd day of April, 2012.

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UNITED STATES OF AMERICA
DEPARTMENT OF ENERGY
OFFICE OF FOSSIL ENERGY

IN THE MATTER OF	)	
	)	**FE DOCKET NO. 11-162-LNG**
Cameron LNG, LLC	)	
	)	

VERIFICATION

WASHINGTON	§
	§
DISTRICT OF COLUBIA	§

Pursuant to C.F.R. §590.103(b), Nathan Matthews, being duly sworn, affirms that he is authorized to execute this verification, that he has read the foregoing document, and that facts stated herein are true and correct to the best of his knowledge, information, and belief.

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Subscribed and sworn to before me this 23 day of April, 2012.

Notary Public

NICHOLAS JAMES LIFE
Commission # 1951418
Notary Public - California
San Francisco County
My Comm. Expires Sep 9, 2015

My commission expires: 09/09/2015