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UNITED STATES OF AMERICA
DEPARTMENT OF ENERGY
OFFICE OF FOSSIL ENERGY

IN THE MATTER OF

Trunkline LNG Export, LLC

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FE DOCKET NO. 13-04-LNG

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

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Trunkline LNG Export, LLC (“Trunkline”) requests authorization to export approximately 2 billion cubic feet per day (bcf/d) of natural gas as liquefied natural gas (LNG) from an existing LNG import terminal located in Lake Charles, Louisiana. This proposal cannot move forward without extensive environmental and economic analyses that Trunkline Export has not provided to the Department of Energy Office of Fossil Energy (DOE/FE). In any event, the available evidence demonstrates that this proposal is inconsistent with the public interest.

In particular, Trunkline argues that the proposal would increase natural gas production in the United States. *See, e.g.*, App. at 18, 19. DOE/FE cannot authorize exports without fairly weighing significant environmental and economic impacts of this production. *See Udall v. Federal Power Comm’n*, 387 U.S. 428, 450 (1967). Exports will also harm the public interest by increasing domestic gas prices and likely increasing global greenhouse gas emissions. Further, although Trunkline asserts that the project will economically benefit the U.S, Trunkline ignores economic harm exports will cause and disregards the economic effect of environmental impacts.

Because Sierra Club’s members have a direct interest in ensuring that environmental harms resulting from domestic natural gas production are minimized, and that any exports do not adversely affect domestic consumers, the Club moves to intervene in this proceeding and protests Trunkline’s application.

I. Sierra Club Should be Granted Intervention

Sierra Club members live and work throughout the area that will be affected by Trunkline's export plan, including in the regions adjacent to the proposed facility and any associated infrastructure. Sierra Club members also live in the domestic gas fields that will likely see increased production as a result of the proposed exports. Sierra Club members everywhere will also be affected by the increased gas prices that would result from completion of proposed LNG export facilities like Trunkline's. As of April 2013, Sierra Club had 2,819 members in Louisiana and 601,150 members overall.¹

To protect our members' interests, Sierra Club moves to intervene in this proceeding, pursuant to 10 C.F.R. § 590.303. Consistent with that rule, Sierra Club states that its rights and interests in this matter include, but are not limited to, the following:

- The environmental consequences of any gas exports from the Trunkline facility, including emissions and other pollution associated with the liquefaction process, environmental damage associated with construction and operation of the facility and associated infrastructure, 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. Members living in these regions will be affected by the 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 economic impacts of any gas exports from the Trunkline facility, whether individually or in concert with exports from other such facilities, including the consequences of price changes upon 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 coal and oil, Sierra Club's interests in this proceeding are directly implicated.
- The public disclosure, in National Environmental Protection Act and other documents, of all environmental, cultural, social, and economic consequences of Trunkline's proposal, and of all alternatives to that proposal.

In short, Sierra Club's members have vital economic, aesthetic, spiritual, personal, and professional interests in the project.

¹ Attached Declaration of Yolanda Andersen at ¶ 7, attached as Exhibit 1.

The 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 Beyond Natural Gas campaign, are dedicated towards promoting a swift transition away from fossil fuels and to reducing the impacts of any remaining natural gas extraction.

Thus, although 10 C.F.R. § 590.303 states no particular standard for intervention, Sierra Club has interests in this proceeding that would be sufficient to support intervention on any standard. This motion to intervene must be granted.²

II. Service

Pursuant to 10 C.F.R. § 590.303, 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

Section 3 of the Natural Gas Act provides that DOE/FE cannot authorize exports unless it finds the exports to be in the public interest. 15 U.S.C. § 717b. DOE/FE must consider environmental factors in the course of this public interest analysis. Accordingly, DOE/FE cannot proceed with Trunkline's application without fully evaluating the environmental impacts of Trunkline's proposal. The National Environmental Policy Act ("NEPA"), 42 U.S.C. § 4332 *et seq.*, provides the congressionally mandated procedure for assessment of these impacts, and NEPA requires that these procedures be completed "at the earliest possible time," *i.e.*, "*before* decisions are made and *before* actions are taken." 40 C.F.R. §§ 1501.2, 1500.1(b) (emphases added). Accordingly, DOE/FE cannot proceed

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

with Trunkline's request for conditional export authorization until the NEPA process is completed, including preparation of an Environmental Impact Statement.

Trunkline's application is essentially silent as to the environmental impacts of the proposal. As we explain below, the proposal will cause three categories of significant environmental harm, and these harms must be considered as part of DOE/FE's public interest analysis. First, the construction and operation of the terminal, pipeline expansion, and any other associated infrastructure will directly impact local water quality, habitats, and air quality. Second, the project will induce additional natural gas production in the United States, primarily hydraulic fracturing (fracking) of unconventional gas sources, thus causing the myriad environmental harms associated with such production. Third, the project will increase domestic gas prices, likely causing an increase in coal-fired electricity generation and thus increasing emissions of greenhouse gases, conventional, and toxic air pollutants.

Moreover, DOE/FE must reject Trunkline's threadbare economic arguments in support of its proposal. Contrary to Trunkline's contentions, the increase in domestic gas prices resulting from LNG export will have adverse and wide-ranging effects on the domestic economy, harming domestic consumers and, as noted above, increasing coal-fired electricity generation. Communities where increased gas production occurs will likely suffer from the "resource curse" and end up worse off than they would have been otherwise. LNG exports will result in net domestic job losses and economic harm to most Americans, overwhelming the purported economic benefits Trunkline asserts.

For these reasons, the reasons stated in Sierra Club's initial and reply comments on the NERA LNG study,³ and the other reasons set forth below, Sierra Club files this protest, pursuant to 10 C.F.R. § 590.304.

A. Legal Standards

DOE/FE has significant substantive and procedural obligations to fulfill before it can authorize Trunkline's export proposal. Here, we discuss some of these obligations created by the Natural Gas Act, National Environmental Policy Act, Endangered Species Act, and the National Historic Preservation Act before explaining why these obligations preclude Trunkline's request for conditional authorization.

³ DOE/FE has commissioned a two part study of the economic impacts of LNG exports. Energy Information Administration, *Effect of Increased Natural Gas Exports on Domestic Energy Markets*, (2012) ("EIA Export Study"), attached as Exhibit 2; NERA Economic Consulting, *Macroeconomic Impacts of LNG Exports from the United States* (2012) ("NERA Study"), attached as Exhibit 3. Sierra Club and others submitted extensive comments on these studies. Sierra Club Initial NERA Comment, attached as Exhibit 4; Synapse Analysis of NERA Study, attached as Exhibit 5; Sierra Club Reply NERA Comment, attached as Exhibit 6.

1. Natural Gas Act

Pursuant to the Natural Gas Act and subsequent delegation orders, DOE/FE must determine whether Trunkline's proposal to export LNG to nations which have not signed a free trade agreement (FTA) with the United States is in the public interest.⁴ Courts, DOE/FE, and the Federal Energy Regulatory Commission (FERC) all agree that the "public interest" at issue in this provision includes environmental impacts as well as economic 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).⁵

Courts interpreting this provision have long held that the "public interest" encompasses the environment. Although 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." *NAACP v. Federal Power Comm'n*, 425 U.S. 662, 670 n.4 (1976) (citing 15 U.S.C. § 717b as an example of a public interest provision); *see also id.* at 670 n.6 (explaining that the public interest includes environmental considerations). Subsequent cases have confirmed *NAACP's* holding that the purposes of the Natural Gas Act include environmental issues. *Pub. Utilities Comm'n of State of Cal. v. F.E.R.C.*, 900 F.2d 269, 281 (D.C. Cir. 1990). In interpreting an analogous public interest provision applicable to hydroelectric power and dams, the Court has explained that the public interest

⁴ The Natural Gas Act separately provides that DOE/FE must approve exports to nations that have signed a free trade agreement requiring national treatment for trade in natural gas "without modification or delay." 15 U.S.C. § 717b(c).

⁵ 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 Redeleation 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).

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 *Udall*’s 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).⁶

DOE and FERC have also acknowledged the breadth of the public interest inquiry and recognized that it encompasses environmental concerns. Most recently, DOE explained that factors weighing on the public interest “include economic impacts, international impacts, security of natural gas supply, and environmental impacts, among others.”⁷ 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). DOE Delegation Order No. 0204-111 interpreted the NGA’s public interest standard to require consideration of matters beyond the mere “domestic need for the gas to be exported.”⁸ Similarly, in FERC’s recent order approving siting, construction, and operation of LNG export facilities in Sabine Pass, Louisiana, FERC considered potential environmental impacts of the terminal as part of its public interest assessment, which is analogous to DOE/FE’s. 139 FERC ¶ 61,039, PP 29-30 (Apr. 14, 2012).⁹

DOE/FE must therefore reject Trunkline’s assertion that domestic need for gas is the only factor to be considered in the public interest analysis. Trunkline asserts that “Once it is determined that an export will not jeopardize supply to domestic needs during the term of the export, the public interest test of Section 3 of the NGA is met, regardless of the impact of the proposed export on domestic prices,” or, by implication,

⁶ 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).

⁷ Order Conditionally Granting Long-Term Multi-Contract Authorization to Export Liquefied Natural Gas by Vessel from The Freeport LNG Terminal on Quintana Island, Texas to Non-Free Trade Agreement Nations, DOE/FE Order No. 3282, 6 (May 17, 2013) (hereinafter “Freeport Conditional Authorization”); accord *Phillips Alaska Natural Gas Corporation and Marathon Oil Company*, 2 FE ¶ 70,317, DOE FE Order No. 1473, 1999 WL 33714706, *22 (April 2, 1999) (specifically enumerating environmental concerns as a factor in the public interest analysis).

⁸ DOE Delegation Order No. 0204-1111, at 1, 49 Fed. Reg. 6686, 6690 (Feb. 22, 1984). This order has been rescinded, but DOE/FE continues to cite it in discussing export applications. *See, e.g.,* Freeport Conditional Authorization, DOE/FE Order 3282, at 7.

⁹ Sierra Club contends that other aspects of this order were wrongly decided, as was FERC’s subsequent denial of Sierra Club’s petition for rehearing, as we explain below.

environmental or other impacts. App at 15.¹⁰ Trunkline's argument is flatly contradicted by the appellate caselaw and by DOE's own interpretation of the NGA. DOE must look beyond mere domestic need for gas in evaluating the public interest.

DOE/FE must also reject Trunkline's invocation of DOE/FE's outdated *import* guidance. In 1984, DOE published *Policy Guidelines and Delegation Orders Relating to the Regulation of Imported Natural Gas*, 49 Fed. Reg. 6,684 (Feb. 22, 1984). The primary issue confronted these guidelines was whether to directly regulate prices at which gas could be imported from Canada.¹¹ DOE/FE determined that, if U.S. buyers were willing to pay market rates for imported gas, this would generally demonstrate a need for that gas.¹² This reasoning does not apply to exports. It would be nonsensical to assume that a foreign purchaser's willingness to pay for gas exported from the United States provides a presumptive indication that there was not a domestic need for that gas. Similarly, a foreign purchaser's willingness to pay for U.S. exports is independent of the environmental impacts that will result from producing that gas: because DOE/FE must consider the latter as part of its public interest analysis, DOE/FE cannot simply presume that the market will reflect the public interest. Sierra Club recognizes that DOE/FE has referred to this guidance in prior export proceedings, but in those proceedings, DOE/FE neither acknowledged nor discussed these differences between imports and exports.¹³

Finally, 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 D.C. Circuit has explained to DOE/FE that this presumption is "highly flexible, creating *only* rebuttable presumptions and leaving parties free to assert other factors." *Panhandle Producers & Royalty Owners Ass'n v. Economic Regulatory Admin.*, 822 F.2d 1105, 1110-11, 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

¹⁰ See also App. at 10 ("[T]his proposed export authorization will not have a detrimental impact on the domestic supply of natural gas and, therefore, is not inconsistent with the public interest."), App. at 9 (implying that DOE/FE need only inquire "whether 'domestic supply shortages or domestic security needs overcome the statutory presumption that a proposed export is not inconsistent with the public interest.'")

¹¹ 49 Fed. Reg. at 6,684-85.

¹² *Id.*

¹³ Freeport Conditional Authorization, Order 3282 at 112, Phillips Alaska, Order 1472, Sabine Pass, Order 2961.

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.

For purposes of the intersection of NEPA and the NGA, the NGA designated the former Federal Power Commission as the “lead agency” for NEPA purposes. 15 U.S.C. § 717n. The lead agency prepares NEPA documents for an action that falls within the jurisdiction of multiple federal agencies. 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. Thus, if the NEPA analysis FERC prepares in its capacity as lead agency is inadequate to fully inform DOE/FE’s decision or discharge DOE/FE’s NEPA obligations, DOE/FE must prepare a separate EIS.¹⁴

NEPA requires preparation of an “environmental impact statement” (EIS) where, as here, the proposed major federal action would “significantly affect[] the quality of the human environment.” 42 U.S.C. § 4332(C). DOE/FE regulations similarly provide 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. FERC has already determined that an EIS will be required here.¹⁵

¹⁴ See *Sabine Pass LNG*, FERC Dkt. CP11-72-001, 140 FERC ¶ 61,076 P 32 (July 26, 2012) (“DOE has separate statutory responsibilities with respect to authorizing the export of LNG from Sabine Pass; thus it has an independent legal obligation to comply with NEPA.”), DOE/FE Dkt. 10-111-LNG, Order 2961-A, 27 (Aug. 7, 2012) (DOE/FE recognizes that it is “responsible for conducting an independent review” of FERC’s analysis and determining whether “the record needs to be supplemented in order for DOE/FE to meet its statutory responsibilities under section 3 of the NGA and under NEPA.”).

¹⁵ See, e.g., 78 Fed. Reg. 18970 (March 28, 2013)

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 proposed 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 Eng'rs*, 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 the cumulative impacts of a proposed action. 40 C.F.R §§ 1502.16, 1508.7, 1508.8; *N. Plains Resource Council v. Surface Transp. Bd.*, 668 F.3d 1067, 1072-73 (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 programmatic EISs). As we discuss below, such an EIS is appropriate here.

Finally, 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.

3. Endangered Species Act

The Endangered Species Act (ESA) directs that all agencies “shall seek to conserve endangered species.” 16 U.S.C. § 1531(c)(1). Consistent with this mandate, DOE/FE must ensure that its approval of Trunkline’s proposal “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).

Here, DOE/FE’s section 1536 inquiry must be wide-ranging, because Trunkline’s export proposal will increase gas production activities nationwide. Thus, DOE/FE must consider not just species impacts at the proposed project site (although it must at least do that), but the effects of increased gas production across the full region the plant affects.

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 Fisheries Service, as appropriate, to avoid jeopardy to endangered species or

adverse modification of critical habitat as a result of its approval of Trunkline'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.

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 Trunkline's proposal extends to the entire area in which it will increase gas production. Thus, to approve Trunkline'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 organization and its members are interested in preserving intact historic landscapes for their ecological and social value, and reside through the regions affected by the Trunkline's proposal. Our 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. All Pending Export Applications, Pipelines, and Studies Must Be Incorporated Into DOE/FE's NEPA, NGA, and Other Analyses

As explained above, the NGA, NEPA, ESA and NHPA all require DOE/FE's determination to be informed by the context in which the proposed project would occur. DOE/FE's analysis must not be confined to local, direct effects of the particular application; DOE/FE must consider the broader constellation of indirect and cumulative effects. Here, to accurately analyze Trunkline's application in context, DOE/FE must also take into account the other LNG export proposals pending before DOE/FE and FERC. This broader backdrop of related and similar projects must inform the NEPA alternatives analysis. Finally, DOE/FE must not grant conditional authorization prior to completion of the NEPA process, including the above analyses.¹⁶

1. DOE/FE Must Consider the Cumulative Effect of All Pending Export Proposals

Trunkline's export 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, DOE/FE must consider these projects' cumulative impacts.

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. All analysts and observers have agreed, for example, that higher volumes of exports will cause greater gas price increases. Indeed, several models indicate that prices increase non-linearly with export volumes. That is, going from 4 to 6 bcf/d in exports, for example, may impact domestic prices more than going from 0 to 2 bcf/d.¹⁷

Accordingly, as DOE/FE and EPA have acknowledged, DOE/FE's NGA, NEPA, and other analyses must consider the full range of pending export proposals, and the cumulative impacts thereof. This must include the full 28.54 bcf/d of exports to non-free trade

¹⁶ Similarly, Sierra Club protests any request for final, rather than conditional, authorization prior to completion of NEPA review.

¹⁷ Robert Brooks, *Using GPCM to Model LNG Exports from the US Gulf Coast* 5 (2012), available at <http://www.rbac.com/press/LNG%20Exports%20from%20the%20US.pdf>, attached as Exhibit 7. The Deloitte Study submitted in connection with the Excelerate application similarly predicts that doubling exports will more than double price impacts thereof. Deloitte MarketPoint, *Analysis of Economic Impact of LNG Exports from the United States*, at 3, 24 ("Deloitte Study"), attached as Exhibit 8 (originally filed as Appendix F to Excelerate Liquefaction Solutions I, LLC, *Application for Long-Term, Multi-Contract Authorization to Export Liquefied Natural Gas to Non-Free Trade Agreement Countries*, DOE/FE Dkt. 12-146-LNG (Oct. 5, 2012)). One reason prices may increase this way is that domestic gas consumers differ in their ability to reduce gas consumption. Robert Brooks, *Using GPCM to Model LNG Exports from the US Gulf Coast*, 7 (2012). As export volumes increase, increasing numbers of inflexible domestic consumers are forced to compete with exports, further driving up prices. When export volumes are lower, by contrast, price-sensitive domestic consumers can respond to price increases by reducing their consumption, freeing gas supplies for exports and limiting price impacts. The Brooks study, which estimates low price-sensitivity, predicts significantly higher price increases than the EIA study. *Id.* at 5, 7.

agreement nations for which applications have been filed with DOE/FE,¹⁸ and rather than merely a subset of exports that DOE/FE determines to be most likely to occur. Indeed, even putting aside the 2.0 bcf/d of exports from the Lake Charles Exports, LLC, application that Trunkline states is “non-additive”¹⁹ with the instant application, there are 20.6 bcf/d of other nFTA export applications that will be reviewed by DOE/FE or *prior to* Trunkline’s application.²⁰ NEPA requires consideration of this full export volume, prohibiting DOE/FE from granting this application or others on the assumption that the authorized activity will not actually occur. Under NEPA, an agency may only exclude analysis of an event and its consequences when the event “is so ‘remote and speculative’ as to reduce the effective probability of its occurrence to zero.” *See New York v. NRC*, 681 F.3d 471, 482 (D.C. Cir. 2012); *see also San Luis Obispo Mothers for Peace v. Nuclear Regulatory Comm’n*, 449 F.3d 1016, 1031 (9th Cir. 2006) (same). Here, DOE/FE cannot rule out as speculative the possibility of all proposed exports occurring. Although the NERA report concluded that only a portion of the proposed exports were likely to occur, several assumptions underlying the NERA report lead it to understate the likelihood of exports, as explained in Sierra Club’s Initial and Reply Comments regarding the NERA report.²¹ We note that in similar proceedings EPA has explicitly requested consideration of this broader context. EPA, *Scoping Comments – The Jordan Cove Energy Project LP*, FERC Dkts. PF12-7 and PF12-17, at 3 (Oct. 29, 2012) (“[W]e recommend discussing the proposed project in the context of the larger energy market, including existing export capacity *and export capacity under application to the Department of Energy*, and clearly describe how the need for the proposed action has been determined.”),²² EPA, *Scoping Comments – Cove Point Liquefaction Project*, FERC Dkt. PF12-16-000, at 2 (Nov. 15, 2012) (“We recommend discussing the proposed project in the context of the broader energy market, *including existing and proposed LNG export capacity.*”),²³ EPA, *Scoping Comments – The Oregon LNG Export Project and Washington Expansion Project*, FERC Dkts. PF12-18 and PF12-20, at 3 (Dec. 26, 2012).²⁴

¹⁸ Applications Received by DOE/FE to Export Domestically Produced LNG from the Lower-48 States (as of March 7, 2013), available at http://fossil.energy.gov/programs/gasregulation/reports/summary_lng_applications.pdf and attached as Exhibit 9.

¹⁹ App. at 3.

²⁰ See Pending Long-Term Applications to Export LNG to Non-FTA Countries - Listed in Order DOE Will Commence Processing , available at http://fossil.energy.gov/programs/gasregulation/publications/export_applications_order_of_precedence.pdf, and Applications Received by DOE/FE to Export Domestically Produced LNG from the Lower-48 States (as of March 7, 2013), available at http://fossil.energy.gov/programs/gasregulation/reports/summary_lng_applications.pdf.

²¹ Sierra Club Initial NERA Comment at 12-13, *infra* n.262; Sierra Club Reply NERA Comment at 11-12, *infra* n.262.

²² Attached as Exhibit 10 (emphasis added).

²³ Attached as Exhibit 11 (emphasis added).

²⁴ Attached as Exhibit 12.

DOE/FE has acknowledged the need to address the cumulative impacts of pending export proposals.²⁵ The NERA study, however, looks only to the subset of exports that NERA deemed to be likely to occur in light of world market conditions, and DOE/FE's recent conditional authorization of the first Freeport nFTA proposal appears to have endorsed this approach.²⁶ While Sierra Club contends that looking only to market predictions of likely exports is unlawful, we also reiterate that NERA understates the market for likely exports. NERA concluded that exports would only occur when the spread between US gas prices and prices in potential foreign markets exceeded the cost of liquefying, transporting, and regassifying US produced gas. As Sierra Club previously explained, NERA overstates these transaction costs and ignores the ways in which "take-or-pay" contracts that appear likely to dominate this industry will distort this market.

As to transaction costs, proposed West Coast terminals will have significantly lower costs for export to Asia than will the Gulf Coast facilities NERA considered. The proposed Jordan Cove Energy Project explained that its transportation costs to Japan were significantly lower than those assumed by the NERA Study. Although Jordan Cove Energy Project would face higher facility construction and thus liquefaction costs than Gulf Coast facilities, Jordan Cove asserts that, in aggregate, its total processing and transportation costs will be \$0.44/MMBtu lower than the estimates used by NERA.²⁷ Accordingly, insofar as the cost of processing and transporting LNG sets the ceiling on price increases resulting from exports, that ceiling could be \$0.44/MMBtu higher than the NERA Study estimates. \$0.44/MMBtu represents roughly 5 to 10% of NERA's predicted 2035 wellhead gas prices, meaning NERA may have significantly underestimated the price range within which exports will occur.²⁸ Although Sierra Club raised this argument in its initial and reply comments on the NERA study,²⁹ DOE/FE did not address it in the Freeport Conditional Authorization.³⁰

As to contract structure, previous export applicants have adopted "take or pay" liquefaction services arrangements, wherein would-be importers will be required to pay a fee to reserve terminal capacity, regardless of whether that capacity is actually used to liquefy and export gas.³¹ The "pay" provision constitutes a sunk cost that will effectively raise the price ceiling under which exports will occur. For example, if the cost to liquefy, transport, and regassify gas is \$4/MMBtu, but an importer has entered a "take or pay"

²⁵ See, e.g., Freeport Conditional Authorization, 112-113.

²⁶ Freeport Conditional Authorization at 89.

²⁷ Comment of Jordan Cove Energy Project at 2.

²⁸ NERA Study, *supra* n.3 at 50.

²⁹ Sierra Club Initial NERA Comment, *supra* n.3, at 12-13, Sierra Club Reply NERA Comment, *supra* n.3, at 11-12.

³⁰ Freeport Conditional Authorization at 95.

³¹ See *Sabine Pass* DOE Order No. 2961, at 4 (May 20, 2011); Cheniere Energy April 2011 Marketing Materials, available at <http://tinyurl.com/cqpp2h8> (last visited Jan. 13, 2013), at 14.

contract reserving terminal capacity but requiring payment of \$1.50/MMBtu³² for unused capacity, the importer will have an incentive to import gas so long as the spread between US and foreign prices exceeds \$2.50/MMBtu, whereas NERA predicts that no exports will occur once the price spread falls below \$4/MMBtu. Exports may continue to occur – and domestic prices may therefore continue to rise – even where NERA predicts that exports will cease.³³ Again, in the Freeport Conditional Authorization, DOE/FE ignored this aspect of Sierra Club’s argument. Sierra Club does not contend that contracts will “lock up natural gas for export” such that exports will occur regardless of market conditions in the US or abroad.³⁴ Instead, Sierra Club has shown that market forces and the industry structure will likely cause exports to occur in certain conditions where NERA concluded that exports would not, such that the overall volume of exports is likely to be higher than NERA forecasts.

Similarly, Trunkline’s “high export scenario” included in its application fails to consider the full scope of potential exports. Trunkline asserts, without evidence, that only 11.8 bcf/d of exports are feasible. App. at 13. Trunkline contends that certain existing terminals will be unable to convert to exports, despite ongoing efforts to convert those terminals. *Compare* App. at 13 (asserting that the Elba Island import terminal will be unable to switch to exports) *with* DOE/FE Dkt. 12-100-LNG (Southern LNG Company, LLC’s, ongoing efforts to effect such a conversion). Trunkline similarly contends that no greenfield export facilities will be constructed, ignoring the numerous efforts underway to construct such facilities. *Compare* App. at 14 *with, e.g.,* DOE/FE Dtk. 12-32-LNG, 12-77-LNG. Trunkline finally cryptically asserts that “Some portion of the capacity of the remaining projects will not be converted to export as it is part of foreign LNG producers’ supply chains and switching to exports would not be consistent with the sponsor aim of maintaining a chain to monetize home resources.” App. at 13. Trunkline does not explain which proposals this statement pertains to or explain the details of why such proposals will be unable to proceed. As such, Trunkline has not provided any basis for considering less than the full range of proposed exports in the cumulative impacts analysis.

In summary, to determine whether Trunkline’s export proposal is consistent with the public interest, DOE/FE must consider not only the effect of the particular proposal, but the effect of that proposal in conjunction with all proposals so far approved and all reasonably foreseeable future proposals. Moreover, this analysis must examine the possibility that all proposals that receive approval will export to the fully authorized extent.

³² Within the \$1.40 to \$1.75/MMBtu range of “capacity fees” contemplated by Sabine Pass’s parent company, Cheniere Energy April 2011 Marketing Materials at 14.

³³ See NERA Study, *supra* n.3, at 37-46.

³⁴ Freeport Conditional Authorization at 91.

2. A Programmatic EIS Is The Best Tool for Considering Exports' Impacts

DOE/FE can best conduct this analysis in the context of a programmatic EIS (whether prepared by FERC or DOE/FE) that considers the impacts of *all* gas export proposals at once. DOE/FE has the discretion to prepare a programmatic EIS, even if it determines that it does not have the duty to do so. *See* 40 C.F.R. § 1508.18(b)(3); 10 C.F.R. § 1021.330. Such a programmatic EIS would allow DOE/FE and the public to understand these proposals' relationship and their cumulative environmental and economic impacts, thus improving DOE/FE's ability to make informed decisions on export applications and allowing DOE/FE, the public, and industry to identify prudent alternatives to serve the public interest and minimize environmental impacts. In acting on the many pending LNG export applications, DOE/FE is making what is functionally a programmatic decision to radically alter the U.S. natural gas market by allowing for large-scale LNG export. DOE/FE has already acknowledged that a programmatic approach is appropriate for discussion of the economic impacts of exports, commissioning nationwide studies of the impacts of exports from EIA and NERA. Environmental impacts should be similarly analyzed. DOE/FE should conduct an EIS that is adequate to inform this programmatic decision, rather than conducting piecemeal, application-by-application analysis.

3. The Alternatives Analysis Must Consider This Broader Context

Both NEPA and the NGA require DOE/FE to fully consider alternatives to Trunkline's proposal. Specifically, the NGA 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. 387 U.S. at 450. Here, likewise, DOE/FE must consider alternatives to Trunkline's export proposal that 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. As mentioned, the alternatives analysis is "the heart of the environmental impact statement," designed to 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," 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).

Here, DOE/FE must consider a broad range of alternatives to Trunkline's proposal, including alternatives that would alter or minimize the economy-wide impacts of the many pending export proposals. Even if DOE/FE does not have jurisdiction to directly order implementation of some of these alternatives, it must include them nonetheless.

DOE/FE should consider, at a minimum and without limitation, the following alternatives:

- (1) Whether, consistent with the EIA Export Study, exports, if allowed, should move forward in smaller quantities or on 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 or better distributing economic or environmental impacts;
- (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 conditioning 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 permit exports only if the export facilities are designed and operated so as to minimize their environmental impacts;
- (8) Whether to deny export proposals altogether 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. DOE/FE May Not Conditionally Approve Trunkline’s Proposal Prior to NEPA Review

DOE/FE must reject Trunkline’s request for a conditional order prior to NEPA review. App. at 23. 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, DOE/FE must weigh environmental interests at the same time that it weighs all other interests. It may not parcel them into a separate process without irrationally ignoring important aspects of the problem before it. Thus, although DOE regulations permit “conditional” orders in general, see 10 C.F.R. § 590.402, this authority cannot extend to the specific context of LNG export authorizations. Indeed, because an EIS is required here, DOE regulations specifically prohibit taking any action prior to completion of the EIS. 10 C.F.R. § 1021.211. Although DOE has granted conditional authorization in two recent LNG export proceedings, DOE did so without considering section 1021.211’s prohibition on action pending completion of an EIS.

Section 1021.211 explicitly provides that DOE “*shall take no action*” concerning a proposal that is the subject of an EIS until the EIS is completed. 10 C.F.R. § 1021.211 (emphasis added).³⁵ Similarly, CEQ’s generally applicable NEPA regulations prohibit agencies from taking any action on a proposal prior to completion of NEPA review if that action if that action tends to “limit the choice of reasonable alternatives,” or “determine subsequent development.” 40 C.F.R. § 1506.1. Here, because an EIS is required but has not yet been completed, DOE/FE cannot issue a conditional authorization now. A conditional approval would limit alternatives, and determine subsequent choices, in precisely the manner the regulations forbid.

DOE/FE has not addressed this regulation in its recent conditional authorizations in other proceedings. Most recently, DOE/FE conditionally authorized exports to nFTA countries pursuant to Freeport’s application in docket 10-161-LNG. Order 3282 at 11. DOE/FE’s decision to issue a conditional authorization was not supported by the two sources of authority fleetingly cited by DOE/FE—10 C.F.R. § 590.402 and DOE/FE Order 2961—and therefore improper. As explained above, although section 590.402 permits conditional orders as a general matter, this general authority cannot trump section

³⁵ Although this regulation states that it applies when “DOE is preparing an EIS that is required” under NEPA, it should be interpreted as applying to any proposed DOE action that is a “major action” requiring preparation of an EIS, regardless of whether the EIS is authored by DOE or another agency.

1021.211's specific prohibition on "any action" pending completion of an EIS. DOE/FE Order 2961, conditionally authorizing exports from Sabine Pass, did not consider this issue, because in that case, both DOE/FE and FERC determined that an EIS was unnecessary, and section 1021.211 therefore did not apply.³⁶ Here, where it has already been determined that a full EIS is required,³⁷ section 1021.211 necessarily applies, and DOE/FE cannot take "any action" until the EIS is completed. Because an EIS is similarly being prepared in the Freeport proceeding,³⁸ DOE/FE should not have issued a conditional authorization there. Issuing a conditional authorization now would similarly violate 40 C.F.R. § 1506.1 prohibition on actions that tend to limit the choice of reasonable alternatives, as demonstrated by the narrow scope of alternatives FERC reviewed in the Sabine Pass proceeding. There, DOE/FE's approval, even if nominally "conditional," plainly influenced the NEPA process. In the Sabine Pass Environmental Assessment, 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."³⁹ This statement reveals FERC's belief that DOE/FE had already made its decision, and thus that the EA was not truly designed assist DOE/FE in deciding *whether* to allow gas exports. An analysis premised on the understanding that the decision had *not* been made after the conditional approval would not have summarily ruled out the no-action alternative. The fact that FERC felt that it was not free to give the no-action alternative serious consideration indicates that conditional approvals in fact tend to limit alternatives and influence decisionmaking.

If DOE/FE nonetheless decides to issue a conditional order prior to NEPA review (in violation of the above prohibitions), this conditional order must provide for further future analysis. As we explain above, DOE/FE has an independent duty to review NEPA documents prepared by FERC and to consider how environmental impacts will affect the public interest. Thus, even if DOE/FE wrongly issues a conditional order prior to completion of NEPA review, DOE/FE must revisit its public interest determination after NEPA review is completed: DOE/FE cannot immediately or automatically grant final authorization once FERC concludes the NEPA process.

To reiterate, however, even this alternative course of action would violate DOE/FE's NGA and NEPA obligations. To avoid placing premature and illegal restrictions on its decisionmaking, DOE/FE may not approve the Trunkline's export proposal, conditionally

³⁶ Although Sierra Club contended that an EIS should have been prepared in that proceeding, DOE/FE declined to consider the merits of this argument. DOE/FE Order 2961-B.

³⁷ 78 Fed. Reg. 18970.

³⁸ 77 Fed. Reg. 43589 (July 25, 2012).

³⁹ FERC, *Environmental Assessment for the Sabine Pass Liquefaction Project*, Dkt. CP11-72, at 3-1 (2011) ("Sabine Pass EA").

or finally, until it has considered the effects of the proposal and the alternatives to it through the NEPA and NGA processes.

C. Trunkline's Proposal Will Have Numerous Harmful Environmental and Other Effects and Is Contrary to The Public Interest

Trunkline's proposal is inconsistent with the public interest. Environmentally, the proposal will harm the environment around the terminal site, in the gas plays where additional production occurs, and nationwide as it induces additional coal use. These environmental injuries all cause economic damage as well. In terms of more purely economic impact, the proposal will raise domestic gas prices, eliminate jobs in manufacturing and other domestic industries, disrupt communities, and regressively transfer wealth from working class families to large corporations. Available evidence indicates that even when these environmental and intra-US distributional effects are ignored (although they must not be), LNG exports will likely have a negative impact on GDP and other measures of aggregate welfare.⁴⁰ Each of these adverse impacts require additional consideration in the NEPA process and in DOE/FE's ongoing review of the economic impacts of gas exports. Even the evidence of adverse impacts available now, however, greatly overwhelms Trunkline's cursory assertion that its proposal is consistent with Presidential objectives and will provide economic benefits.

The environmental harms caused by Trunkline's proposal can be divided into three categories: direct effects of the terminal and any associated infrastructure, indirect effects of the additional gas production the project will induce, and non-localized indirect effects resulting from increased domestic gas prices and resulting increases in coal combustion. As we explain below, each of these categories of effects must be considered in DOE/FE's NEPA and NGA analyses, and each weighs against finding that the proposed project is consistent with the public interest.⁴¹ Somewhat separate from these environmental impacts are the harms to US communities and employees as a result of the proposed exports. In light of these costs and a more sober assessment of the project's benefits, if DOE/FE were to make a decision on the available record (rather than engaging in further study of these issues, as is warranted here), DOE/FE would have to conclude that these impacts outweigh any possible benefit of the project.

1. Local Environmental Impacts

⁴⁰ See Kemal Sarica & Wallace E. Tyner, *Economic and Environmental Impacts of Increased US Exports of Natural Gas* (Purdue Univ., Working Paper, 2013) (available from the authors); see also Wallace Tyner, Initial Comment on NERA Study (Jan. 14, 2013) (summarizing the results of the above study), attached as Exhibit 13.

⁴¹ Sierra Club anticipates providing additional information regarding these impacts as part of the NEPA process, when additional information regarding the proposal, and FERC's assessment thereof, is made available.

Construction and operation of liquefaction and export facilities will have a range of adverse environmental effects. Sierra Club cannot provide a thorough discussion of local impacts in this filing, because the precise nature and extent of these impacts will depend on the final site design and plan, which Trunkline has not yet provided. However, these effects undoubtedly impact the public interest; DOE/FE must consider these impacts in its public interest analysis; and Sierra Club, together with the broader public, must be given an opportunity to comment on these issues once additional information is available. At this time, we identify the types of issues that the facility is likely to have, informed by the designs of other facilities. Adverse environmental effects include (but are not limited to) air pollution, disruption of aquatic habitat, increased noise and light pollution, and impacts on fish and wildlife related to the preceding impacts. These impacts must be considered in both the NEPA analysis and in DOE/FE's public interest determination.

a. Local Air Emissions

Whatever design is ultimately used, both construction and operation phases of Trunkline's proposed liquefaction and associated facilities will emit harmful quantities of carbon monoxide (CO), nitrogen oxides (NO_x), volatile organic chemicals (VOC), greenhouse gases (GHGs), sulfur dioxides (SO_x), particulate matter (PM₁₀ and PM_{2.5}), and hydrogen sulfide (H₂S).

VOC and NO_x

Liquefaction and export equipment will emit harmful amounts of VOC and NO_x. Sources of these pollutants include the liquefaction trains, pipeline compressor stations, ships, and other equipment. Liquefaction trains in particular can emit many thousands of tons per year of NO_x when powered by simple-cycle gas turbines, as has been proposed for the Sabine Pass, Louisiana and Corpus Christi, Texas LNG export terminals.⁴²

These emissions will harm the environment because VOC and NO_x contribute to the formation of ground-level ozone (also called smog). Smog pollution harms human respiratory systems and has been linked to premature death, heart failure, chronic respiratory damage, and premature aging of the lungs.⁴³ 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

⁴² Sabine Pass EA, *supra* n.39, at 2-56, t.2.7-7; Corpus Christi Liquefaction *et al.*, FERC Dkt. CP12-507, Resource Report 9, 9-7 to 9-9 (Aug. 31, 2012).

⁴³ EPA, *Proposed New Source Performance Standards and Amendments to the National Emissions Standards for Hazardous Air Pollutants for the Oil and Natural Gas Industry: Regulatory Impact Analysis*, 4-25 (July 2011) ("O&G NSPS RIA"), available at <http://www.epa.gov/ttnecas1/regdata/RIAs/oilnaturalgasfinalria.pdf>, attached as Exhibit 14; Jerrett *et al.*, *Long-Term Ozone Exposure and Mortality*, *New England Journal of Medicine* (Mar. 12, 2009), available at <http://www.nejm.org/doi/full/10.1056/NEJMoa0803894#t=articleTop>, attached as Exhibit 15.

existing respiratory conditions are the most at risk from ozone pollution.⁴⁴ Significant ozone pollution also damages plants and ecosystems.⁴⁵

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.⁴⁶

CO

Operation of LNG export terminals such as the proposed project also causes emissions of CO. The Sabine Pass project has the potential to emit 4,759 tons per year of CO from liquefaction activities.⁴⁷ Even where more stringent pollution controls are proposed, such as in the Oregon LNG project, anticipated direct emissions exceed 150 tpy of CO, with an additional 197.18 tpy from marine vessels.⁴⁸ Construction of LNG export terminals can also emit substantial amounts of CO. For example, construction of the Sabine Pass terminal is anticipated to cause 164 tpy of CO emissions in the heaviest construction year.⁴⁹

CO can cause harmful health effects by reducing oxygen delivery to the body's organs and tissues.⁵⁰ CO can be particularly harmful to persons with various types of heart disease, who already have a reduced capacity for pumping oxygenated blood to the heart. "For these people, short-term CO exposure further affects their body's already compromised ability to respond to the increased oxygen demands of exercise or exertion."⁵¹

GHGs

Operation of LNG export terminals such as the proposed project also results in emission of greenhouse gases. To again use the Sabine Pass and Oregon LNG proposals as examples, these facilities are anticipated to emit 2.6 and 3.9 million tpy of carbon

⁴⁴ 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>, attached as Exhibit 17.

⁴⁵ O&G NSPS RIA, *supra* n.43, at 4-26.

⁴⁶ *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, attached as Exhibit 18.

⁴⁷ Sabine Pass EA, *supra* n.39, at 2-56 t.2.7-7.

⁴⁸ *LNG Development Company, LLC, d/b/a Oregon LNG*, FERC Dkt. No. PF12-18, Draft Resource Report 9 at 9-16 to 9-18 (Aug. 31, 2012) ("Oregon LNG RR").

⁴⁹ *Id.* at 2-52 to 2-53, t.2.7-5 (2011).

⁵⁰ EPA, *Carbon Monoxide, Health*, <http://www.epa.gov/air/carbonmonoxide/health.html>, last visited Dec. 14, 2012, attached as Exhibit 19.

⁵¹ *Id.*

dioxide equivalent in greenhouse gases.⁵² These greenhouse gas emissions will increase global warming, harming both the local and global environments. The impacts of global warming 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.”⁵³ 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.⁵⁴ 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.⁵⁵ Vulnerable populations—such as children, the elderly, and those with existing health problems—are the most at risk from these threats.

Sulfur Dioxide

The Oregon LNG proposal, for example, would directly emit an estimated 72 tpy of SO₂, with an additional 80.88 tpy emitted by marine vessel traffic.⁵⁶ 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.⁵⁷ PM is discussed separately below. Sulfur dioxide can also cause haze, or decreased visibility.

Particulate Matter/Fugitive Dust

Operation of LNG export terminals such as the proposed project also results in emission of particulate matter. For example, the proposed Oregon LNG terminal and compressor stations will directly emit an estimated 14.9 tpy of particulate matter, with an additional 51.2 tpy emitted by marine vessel traffic.⁵⁸

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 (PM₁₀), and “fine particles” which are less than

⁵² Sabine Pass EA, *supra* n.39, at 2-57 t.2.7-8, Oregon LNG RR, *supra* n.48 at RR 9-16 to 9-19.

⁵³ Oil and Natural Gas Sector: New Source Performance Standards and National Emission Standards for Hazardous Air Pollutants Reviews, 76 Fed. Reg. at 52,738, 52,791-22 (citing U.S. EPA, 2011 U.S. GREENHOUSE GAS INVENTORY REPORT EXECUTIVE SUMMARY (2011)), attached as Exhibit 20.

⁵⁴ *Id.* at 66,532–33.

⁵⁵ EPA, *Climate Change, Health and Environmental Effects*, available at <http://epa.gov/climatechange/effects/health.html>, attached as Exhibit 21.

⁵⁶ Oregon LNG RR, *supra* n.48, at 9-16 to 9-19.

⁵⁷ EPA, Sulfur Dioxide, Health, available at <http://www.epa.gov/air/sulfurdioxide/health.html>, attached as Exhibit 22.

⁵⁸ Oregon LNG RR, *supra* n.48, at 9-16 to 9-19.

2.5 micrometers in diameter (PM_{2.5}). PM₁₀ 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.⁵⁹

Construction of LNG terminals can also be a significant source of particulate matter as well. Construction PM emissions result from fugitive dust raised by construction activities; dust generated can be substantial, depending on the size of the area disturbed and the nature of the construction activities. For the Sabine Pass proposal, construction was estimated to cause 658 tpy of PM₁₀ and 99 tpy of PM_{2.5} fugitive dust emissions, even after application of dust suppressant controls.⁶⁰

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.⁶¹ PM also reduces visibility,⁶² and may damage important cultural resources.⁶³ Black carbon, a component of PM emitted by combustion sources such as flares and older diesel engines, also warms the climate and thus contributes to climate change.⁶⁴

b. Other Local Impacts

The proposed project will also likely impact local water quality, fish and wildlife, and other environmental resources. Likely water impacts include the effects of water withdrawals necessary for terminal construction and pipeline pressure testing, stormwater runoff from the facility, discharge and suspension or re-suspension of sediment as a result of dredging and ship transits. These water quality impacts, as well as other disturbances from construction and operation, will affect local fish and wildlife. The Sierra Club intends to submit comments during the NEPA process that more fully explore local environmental impacts in light of the project design.

⁵⁹ See EPA, Particulate Matter, Health, available at <http://www.epa.gov/pm/health.html>, attached as Exhibit 23; 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.

⁶⁰ Sabine Pass EA, *supra* n.39, at 2-52 t.2.7-4.

⁶¹ O&G NSPS RIA, *supra* n.43, at 4-19; EPA, Particulate Matter, Health

⁶² EPA “Visibility – Basic Information” <http://www.epa.gov/visibility/what.html>, attached as Exhibit 24.

⁶³ See EPA, Particulate Matter, Health, *supra* n.59; West Tavaputs EIS, *supra* n.59, at 3-19; O&G NSPS RIA, *supra* n.43, at 4-24.

⁶⁴ UNEP Report at 6; IPCC (2007) at Section 2.4.4.3.

2. Environmental Impacts of Induced Gas Production

Further, and likely greater, environmental impacts will result from increased gas production. Trunkline, the EIA, NERA, essentially every other LNG export applicant, and other informed commenters all agree that LNG exports will induce additional production in the United States, with a general agreement that roughly 63% of exported gas will come from new production.

Available tools also allow DOE to predict where increased production will occur, although such localized predictions are not necessary for meaningful analysis of environmental impacts. NEPA and the NGA therefore require DOE/FE to consider the effects of this additional production. Although DOE/FE recently refused to consider induced production in the *Sabine Pass* proceeding, that order applied the wrong legal standard of foreseeability and is factually incorrect (and factually distinct from the present case) as it understates DOE's ability to predict induced drilling.

a. Trunkline's Proposal Will Induce Additional U.S. Gas Production

Trunkline's application acknowledges that exports will induce additional production. App. at 16, 18, 19. The EIA and private modelers agree that domestic gas production will increase in response to exports. These models agree as to the size of this increase, and they have the capacity to predict where this additional production will occur.

The EIA predicts that "about 60 to 70 percent" (63% in EIA's reference cases) of additional demand created by LNG exports would be met by increases in domestic production, with "about three quarters of this increased production [coming] from shale sources."⁶⁵ Although Trunkline's application does not provide a specific estimate, it repeatedly asserts that its proposed exports will increase domestic gas production. *See, e.g.*, App. at 16 (asserting that increases in production will limit price impacts), 18 ("The proposed export of LNG would allow natural gas that might otherwise be shut-in to be sold in the global LNG market, spurring the development of new natural gas resources that might not otherwise make their way to market"), 19 ("Exporting natural gas . . . provid[es] a much needed boost to local, regional and national economies through resources development").

Available models not only predict the extent to which domestic gas production will increase in response to exports—the models can also predict where these production increases will occur. Trunkline "anticipates that sources of gas will include Texas and Louisiana producing regions and the offshore gulf producing regions." App. at 7. EIA can provide more specific estimates. EIA's core analytical tool is the National Energy Modeling System ("NEMS"). NEMS was used to produce the EIA exports study. NEMS

⁶⁵ *Id.* at 6, 10.

models the economy's energy use through a series of interlocking modules that represent different energy sectors on geographic levels.⁶⁶ Notably, the "Natural Gas Transmission and Distribution" module models the relationship between U.S. and Canadian gas production, consumption, and trade, specifically projecting U.S. production, Canadian production, imports from Canada, *etc.*⁶⁷ For each region, the module links supply and demand annually, taking transmission costs into account, in order to project how demand will be met by the transmission system.⁶⁸ Importantly, the Transmission Module is *already* designed to model LNG imports and exports, and contains an extensive modeling apparatus allowing it to do so on the basis of production in the U.S., Canada, and Mexico.⁶⁹ At present, the Module focuses largely on LNG imports, reflecting U.S. trends up to this point, but it also already links the Supply Module to the existing Alaskan *export* terminal and projects exports from that site and their impacts on production.⁷⁰

Similarly, EIA's "Oil and Gas Supply" module models individual regions and describes how production responds to demand across the country. Specifically, the Supply Module is built on detailed state-by-state reports of gas production curves across the country.⁷¹ As EIA explains, "production type curves have been used to estimate the technical production from known fields" as the basis for a sophisticated "play-level model that projects the crude oil and natural gas supply from the lower 48."⁷² The module distinguishes coalbed methane, shale gas, and tight gas from other resources, allowing for specific predictions distinguishing unconventional gas supplies from conventional supplies.⁷³ The module further projects the number of wells drilled each year, and their likely production – which are important figures for estimating environmental impacts.⁷⁴ In short, the supply module "includes a comprehensive assessment method for determining the relative economics of various prospects based on future financial considerations, the nature of the undiscovered and discovered resources, prevailing risk factors, and the available technologies. The model evaluates the economics of future exploration and development from the perspective of an operator making an investment decision."⁷⁵ Thus, for each play in the lower 48 states, the EIA is able to

⁶⁶ EIA, *The National Energy Modeling System: An Overview*, 1-2 (2009), attached as Exhibit 25, available at [http://www.eia.gov/oiaf/aeo/overview/pdf/0581\(2009\).pdf](http://www.eia.gov/oiaf/aeo/overview/pdf/0581(2009).pdf).

⁶⁷ *Id.* at 59.

⁶⁸ EIA, *Model Documentation: Natural Gas Transmission and Distribution Module of the National Energy Modeling System*, 15-16 (2012), attached as Exhibit 26, available at [http://www.eia.gov/FTP/ROOT/modeldoc/m062\(2011\).pdf](http://www.eia.gov/FTP/ROOT/modeldoc/m062(2011).pdf).

⁶⁹ *See id.* at 22-32.

⁷⁰ *See id.* at 30-31.

⁷¹ EIA, *Documentation of the Oil and Gas Supply Module*, 2-2 (2011), attached as Exhibit 27, available at [http://www.eia.gov/FTP/ROOT/modeldoc/m063\(2011\).pdf](http://www.eia.gov/FTP/ROOT/modeldoc/m063(2011).pdf).

⁷² *Id.* at 2-3.

⁷³ *Id.* at 2-7.

⁷⁴ *See id.* at 2-25 to 2-26.

⁷⁵ *Id.* at 2-3.

predict future production based on existing data. The model is also equipped to evaluate policy changes that might impact production; according to EIA, “the model design provides the flexibility to evaluate alternative or new taxes, environmental, or other policy changes in a consistent and comprehensive manner.”⁷⁶ Thus, there is no technical barrier to modeling where exports will induce production going forward. Indeed, EIA used this model for its export study, which forecast production and price impacts.

Deloitte Marketpoint, whose work Trunkline cites, has provided similar discussion of the ways exports will induce domestic production.⁷⁷ Deloitte explains that its “World Gas Model” includes detailed global gas resources, including modeling of “575 plays in the US alone.”⁷⁸ For this model, “Within each major region are very detailed representations of many market elements: production, liquefaction, transportation, market hubs, regasification and demand by country or sub area.” *Id.* at 24. This includes modeling individual “producers, pipelines, refineries, ships, distributors, and consumers.” *Id.* Deloitte applied this model to another proposal and derived specific volumes of predicted production increases in five distinct shale gas plays. *Id.* at 14. While Deloitte only provides as aggregate estimates for other shale plays and for non-shale sources, it appears that Deloitte’s model is capable of providing geographically specifying where this aggregated production will occur. We offer no opinion at this time about the strengths or weaknesses of Deloitte’s models relative to EIA’s. We simply note that multiple tools exist which allow predictions of how and where production will respond to exports.

b. Induced Production Must Be Considered in the NEPA and NGA Analyses

NEPA regulations, applicable case law, and recent EPA scoping comments all call for DOE/FE to consider the environmental effects of induced production. As noted above, NEPA requires consideration of “indirect effects” of the proposed action, which include “growth inducing effects” and “reasonably foreseeable” effects “removed in distance” from the site of the proposed action. 40 C.F.R. § 1508.8(b). Here, induced production is not only an effect of the project – it is part of the justification offered for it. *See., e.g.,* App. at 16, 18-19. It is therefore plainly a “reasonably foreseeable” effect that must be analyzed in NEPA.

Several courts have held that natural resource production and other analogous upstream impacts induced by new infrastructure development must be considered in NEPA. The Eighth Circuit illustrated the “reasonably foreseeable” standard in analogous circumstances considering the converse of the dynamic here, holding that increased consumption was a reasonably foreseeable consequence of increased supply. *Mid*

⁷⁶ *Id.*

⁷⁷ Deloitte Study, *supra* n.17, at 14.

⁷⁸ *Id.* at 25.

States Coalition for Progress v. Surface Transportation Board, 345 F.3d 520 (8th Cir. 2003). At issue there was Surface Transportation Board award of a certificate of “public convenience and necessity” for construction of a rail line under 49 U.S.C. § 10901. 345 F.3d at 533. This line would provide an additional, shorter, faster, and cheaper route to market for low-sulfur coal mined in the Powder River Basin. *Id.* at 549. Sierra Club argued that the project would therefore increase nationwide consumption of coal, consequently increasing emissions of many harmful air pollutants, and that NEPA required consideration of this effect. *Id.* The Board had refused to analyze the impacts of this increased coal consumption. Specifically, the Board argued that any changes in domestic coal consumption would occur regardless of whether the line was built, because existing rail lines already provided a route between the mines and existing demand. *Id.* The court rejected the Board’s view. The project would increase the availability of inexpensive low sulfur coal, making coal “a more attractive option” to potential consumers. *Id.* Provision of a cheaper and more plentiful supply of coal would “most assuredly affect the nation’s long-term demand for coal.” *Id.* Accordingly, an increase in coal consumption was reasonably foreseeable, and NEPA required consideration of this impact. *Id.*

Similarly, the Ninth Circuit recently held that, where the Surface Transportation Board was considering a proposal to expand a railway line which would enable increased coal production at several mines, NEPA required the Board to consider the impacts of increased mining. *N. Plains Resource Council v. Surface Transp. Bd.*, 668 F.3d 1067, 1081-82 (9th Cir. 2011). In *Northern Plains*, the court pointed to the agency’s reliance on the induced coal mine development “to justify the financial soundness of the proposal,” *id.* at 1082. Because the agency anticipated induced coal production in justifying its proposal, such production was reasonably foreseeable, and NEPA analysis of its impacts was required. Here, a decision by DOE/FE to rely on the supposed economic benefits of increased production, while simultaneously ignoring the impacts of this production, would be squarely inconsistent with *Northern Plains*.

Border Power Plant Working Group v. DOE, 260 F. Supp. 2d 997 (S.D. Cal. 2003), also required consideration of upstream environmental impacts induced by the construction of new energy infrastructure. That case involved applications to construct and operate transmission lines across the U.S.-Mexico border. The court held that DOE was required to consider the environmental effects of upstream electricity generation induced by the new infrastructure, rejecting DOE’s decision to exclude these upstream impacts from analysis.⁷⁹ *Id.* at 1017. Consideration of induced impacts was required even though the upstream electricity generation would occur in Mexico, outside the jurisdiction of DOE or any other U.S. agency. *Id.* at 1016-17. Here, too, DOE/FE is required to consider the

⁷⁹ The final EIS for the project at issue in *Border Power Plant Working Group*, produced after remand from the court, is available at <http://energy.gov/nepa/downloads/eis-0365-final-environmental-impact-statement>. Upstream air quality impacts are considered in pages 4-43 to 4-65 of this final EIS.

impacts of natural gas production induced by Trunkline's proposal, regardless of DOE's regulatory authority over that production.

EPA has also argued, in scoping comments it submitted regarding three other LNG export proposals, that induced production should be included in NEPA review. In scoping comments for the Jordan Cove project, EPA opined that in light of the regulatory definition of indirect effects and the EIA Export Study's prediction of induced production, "it is appropriate to consider available information about the extent to which drilling activity might be stimulated by the construction of an LNG export facility on the west coast, and any potential environmental effects associated with that drilling expansion."⁸⁰ EPA used similar language regarding the Oregon LNG proposal.⁸¹ EPA's scoping comments for the Cove Point facility in Maryland also recommended analyzing "indirect effects related to gas drilling and combustion," and stressed that, in addition to reviewing the *economic* impacts of induced drilling, DOE/FE should "thoroughly consider the indirect and cumulative *environmental* impacts" of export.⁸²

Although DOE/FE recently "accept[ed] and adopt[ed] [FERC's] determination that induced shale gas production is not a reasonably foreseeable effect [of LNG exports] for purposes of NEPA analysis" in its August *Sabine Pass* order, DOE/FE should not follow *Sabine Pass* here. The *Sabine Pass* order factual and legal errors and thus should not be the basis for future DOE/FE decisions.⁸³ Although DOE/FE recently denied our petition for rehearing of that order, DOE/FE did so without reaching the merits of our petition, and as such, DOE/FE has not responded to the errors we identified therein.⁸⁴

The first flaw in DOE/FE's *Sabine Pass* decision is that DOE/FE refused to analyze reasonably foreseeable future environmental effects based on its unlawful demand that these effects' scope and nature first be known with a high degree of certainty. DOE/FE stated that it is "unknown" if "any" new production will result from the proposed exports. *Sabine Pass* at 28. Although it is true that the precise scope of production impacts cannot be determined with complete certainty, certainty is not required. "An impact is 'reasonably foreseeable' if it is 'sufficiently likely to occur that a person of ordinary prudence would take it into account in reaching a decision.'" *City of Shoreacres v. Waterworth*, 420 F.3d 440, 453 (5th Cir. 2005) (quoting *Sierra Club v. Marsh*, 976 F.2d 763, 767 (1st Cir. 1992)). NEPA requires "[r]easonable forecasting and speculation," and

⁸⁰ EPA, *Scoping Comments – The Jordan Cove Energy Project LP*, *supra* n.22, at 14.

⁸¹ EPA, *Scoping Comments – The Oregon LNG Export Project and Washington Expansion Project*, *supra* n.24

⁸² EPA, *Scoping Comments – Cove Point Liquefaction Project*, *supra* n.23, at 2-3 (emphasis added).

⁸³ DOE is not bound by its prior decisions: it may reverse its position "with or without a change in circumstances" so long as it provides "a reasoned analysis" for the change. *Louisiana Pub. Serv. Comm'n v. FERC*, 184 F.3d 892, 897 (D.C. Cir. 1999) (quoting *Motor Vehicle Mfrs. Ass'n v. State Farm Mut. Auto. Ins. Co.*, 463 U.S. 29, 57 (1983)).

⁸⁴ DOE/FE Order 2961-B, Jan. 25, 2013.

courts “must reject any attempt by agencies to shirk their responsibilities under NEPA by labeling any and all discussion of future environmental effects as ‘crystal ball inquiry.’” *Scientists’ Inst. for Pub. Info., Inc. v. Atomic Energy Comm’n*, 481 F.2d 1079, 1092 (D.C. Cir. 1973). As explained above, every available source concludes that it is *likely* that the majority of exported gas will come from induced additional production. Thus, an aggregate production increase is unarguably a “reasonably foreseeable” consequence of exports.

DOE/FE’s second error in *Sabine Pass* was to adopt FERC’s conclusion that induced production was outside the scope of NEPA analysis because “while it may be the case that additional shale gas development will result from the Liquefaction Project, the amount, timing and location of such development activity is simply unknowable at this time.” *Sabine Pass* at 13 (quoting 140 FERC ¶ 61,076, P9 (July 26, 2012)). Such specific, localized predictions are not required for meaningful environmental analysis, but even if they were, DOE/FE has the resources to provide them.

As a threshold matter, analysis of the environmental impacts of induced gas production does not require knowledge of the precise sites where additional production will occur. Environmental costs (and the economic costs that accompany them) can be determined in the aggregate. The net increases in, for instance, air pollution associated with the number of wells that will be induced can be quantified based on EPA’s emissions inventories, for instance. The net volumes of waste can similarly be derived from industry reports and state discharge figures. And these impacts can be localized, at a minimum, by region. Indeed, for some of the environmental impacts of production, such as emissions of many air pollutants and consumption of water, the impacts are likely to be experienced at the regional level, so there may be little value in localizing them further. Even for those impacts that are more closely tied to a specific location, such as habitat fragmentation, DOE/FE can and must acknowledge that the impact will occur, including an estimate of the severity of the impact averaged across potential locations. *See Scientists’ Inst. for Pub. Info.*, 481 F.2d at 1096-97 (where there are reasonable estimates of the deployment of nuclear power plants, the amount of waste produced, and the land needed to store waste, NEPA required analysis of the impacts of such storage even though the agency could not predict *where* such storage would occur).

Even if DOE/FE were to conclude, wrongly, that NEPA only requires analysis of induced drilling impacts that can be predicted to occur in a particular location, DOE/FE has the tools to make precisely that prediction, as explained in the previous section. If such local impact predictions are not yet in the record, NEPA regulations provide that DOE/FE “shall” obtain this information unless DOE/FE demonstrates that the costs of obtaining it are “exorbitant.” 40 C.F.R. § 1502.22.

In summary, all the available evidence indicates that Trunkline’s proposed exports will induce additional gas production in the U.S. This increase is reasonably foreseeable, and its environmental effects must be analyzed under NEPA.

c. Induced Production Will Impose Significant Environmental Harms

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. DOE/FE must consider the increase in these environmental harms that exports are likely to stimulate.

Much of the induced production resulting from exports is likely to come from shale gas and other unconventional sources. EIA has concluded that “[o]n 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.⁸⁵ A subcommittee of the DOE’s Secretary of Energy’s Advisory Board recently highlighted “a real risk of serious environmental consequences” resulting from continued expansion of shale gas production.⁸⁶ Shale gas production (as well as coalbed and tight sands production) requires the controversial practice of hydraulic fracturing, or fracking. As we explain below, natural gas production in general, and fracking in particular, impose a large number of environmental harms. Although some states and federal agencies are taking steps to limit these harms, these efforts are uncertain and, even if fully implemented, will not eliminate the environmental harms.

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. See Figure 1, below. EPA has moved to correct some of these problems with new air regulations finalized last year, but, as we later discuss, these standards do not fully address the problem. FERC must therefore consider the air pollution impacts of increased natural gas production despite EPA’s rules.

Air Pollution Problems from Natural Gas

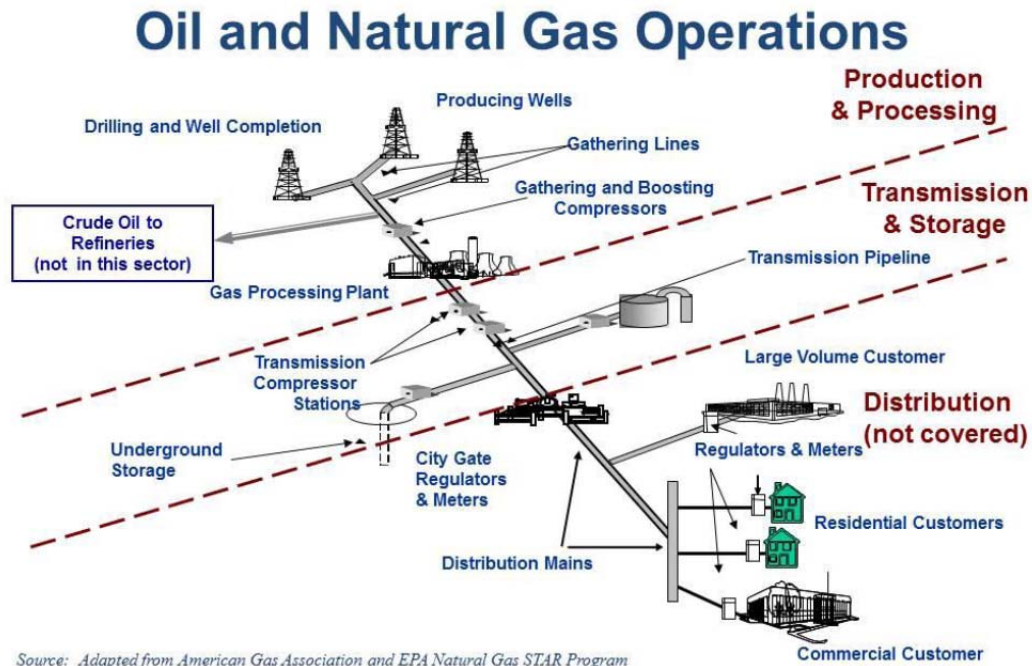
Natural gas production operations emit methane (CH₄), volatile organic compounds (VOCs), nitrogen oxides (NO_x), sulfur dioxide (SO₂), hydrogen sulfide (H₂S), and particulate matter (PM₁₀ and PM_{2.5}). These operations also emit listed hazardous air pollutants (HAPs) in significant quantities, and so 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)

⁸⁵ EIA Export Study, *supra* n.3, at 11.

⁸⁶ DOE, Secretary of Energy’s Advisory Board, Shale Gas Production Subcommittee Second 90-Day Report (2011) at 10, attached as Exhibit 28. See also DOE, Shale Gas Production Subcommittee First 90-Day Report, attached as Exhibit 29.

natural gas transmission, and (4) natural gas distribution.⁸⁷ 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.

Figure 1: The Oil and Natural Gas Sector



There is strong evidence that emissions from natural gas production are higher than have been commonly understood. In particular, a recent study by a consortium of researchers led by the National Ocean and Atmospheric Administration (NOAA) Earth System Research Laboratory recorded pollution concentrations near gas fields substantially greater than EPA estimates would have predicted. That study monitored air quality around oil and gas fields.⁸⁸ The researchers observed high levels of methane, propane, benzene, and other volatile organic compounds in the air around the fields. According to the study authors, 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, which would imply a leak rate of

⁸⁷ 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, at 2-4 (July 2011) (“2011 TSD”), attached as Exhibit 30.

⁸⁸ 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 31.

about 4.8% of production.⁸⁹ A second NOAA study, recently announced, suggests that leak rates may be as high as 9%, suggesting even more severe consequences.⁹⁰

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.⁹¹ Elevated levels of these pollutants correspond to increased cancer risks for people living within half of a mile of a well⁹² – a very large population which will increase as drilling expands.

We discussed the harmful effects of many of these pollutants in part III.C.1.a, above. Below, we detail the sources of emissions within the gas production industry and provide further information regarding the serious global, regional, and local impacts these exploration and production emissions entail:

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. EPA has identified natural gas systems as the “single largest contributor to United States anthropogenic methane emissions.”⁹³ The industry is responsible for over 40% of total U.S. methane emissions.⁹⁴ Methane causes harm both because of its contributions to climate change and as an ozone precursor.

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.⁹⁵ Because of methane’s effects on climate, EPA has found that methane, along with five other well-mixed greenhouse gases, endangers

⁸⁹ *Id.* at 4304.

⁹⁰ J. Tollefson, *Methane leaks erode green credentials of natural gas*, *Nature* (2013), attached as Exhibit 32.

⁹¹ 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 33.

⁹² *Id.* at 2.

⁹³ Oil and Natural Gas Sector: New Source Performance Standards and National Emission Standards for Hazardous Air Pollutants Reviews, 76 Fed. Reg. 52,738, 52,792 (Aug. 23, 2011), attached as Exhibit 34. 76 Fed. Reg. 52,738, *supra* n.53, at 52,792.

⁹⁴ *Id.* at 52,791–92.

⁹⁵ IPCC 2007—*The Physical Science Basis*, Section 2.10.2, and *IPCC 2007- Summary for Policymakers*, attached as Exhibit 35. We note that these global warming potential 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.

public health and welfare within the meaning of the Clean Air Act.⁹⁶ The oil and gas production industry is a significant emitter of this dangerous pollutant; its methane emissions amount to 5% of all carbon dioxide equivalent (CO₂e) emissions in the country.⁹⁷

Methane also reacts in the atmosphere to form ozone.⁹⁸ As we discuss elsewhere, ozone is a major public health threat, linked to a wide range of maladies. In addition to these public health harms, ozone can damage vegetation, agricultural productivity, and cultural resources. Ozone is also a greenhouse gas, 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 also a major source of two other ozone precursors: VOCs and NO_x.⁹⁹ VOCs are emitted from well drilling and completions, compressors, pneumatic devices, storage tanks, processing plants, and as fugitives from production and transmission.¹⁰⁰ The primary sources of NO_x are compressor engines, turbines, and other engines used in drilling and hydraulic fracturing.¹⁰¹ NO_x is also produced when gas is flared or used for heating.¹⁰²

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.¹⁰³ Of the nine counties surrounding the Dallas Fort Worth area that EPA has designated as “nonattainment” for ozone, five contain significant oil and gas

⁹⁶ 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 36.

⁹⁷ 76 Fed. Reg. 52,738, *supra* n.93, at 52,791–92.

⁹⁸ *Id.* at 52,791.

⁹⁹ See, e.g., Al Armendariz, Emissions from Natural Gas Production in the Barnett Shale Area and Opportunities for Cost-Effective Improvements (Jan. 26, 2009), available at http://www.edf.org/documents/9235_Barnett_Shale_Report.pdf (hereinafter “Barnett Shale Report”) at 24, attached as Exhibit 37.

¹⁰⁰ See, e.g., 2011 TSD, *supra* n.87, at 4-7, 5-6, 6-5, 7-9, 8-1 (Exhibit 30); see also Barnett Shale Report, *supra* n.99, at 24 (Exhibit 37).

¹⁰¹ See, e.g., 2011 TSD, *supra* n.87, at 3-6; Barnett Shale Report, *supra* n.99, at 24 (Exhibit 37); 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.), attached as Exhibit 38.

¹⁰² 2011 TSD, *supra* n.87, 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>, attached as Exhibit 39.

¹⁰³ Texas Railroad Commission history of Barnett Shale, attached as Exhibit 40.

development.¹⁰⁴ 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.¹⁰⁵

Oil and gas development has also brought serious ozone pollution problems to rural areas, such as western Wyoming.¹⁰⁶ On March 12, 2009, the governor of Wyoming recommended that the state designate Wyoming's Upper Green River Basin as an ozone nonattainment area.¹⁰⁷ 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."¹⁰⁸ 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.¹⁰⁹ Residents have faced repeated warnings regarding elevated ozone levels and the resulting risks of going outside.¹¹⁰

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

¹⁰⁴ Barnett Shale Report, *supra* n.99, at 1, 3 (Exhibit 37).

¹⁰⁵ *Id.* at 1, 25-26.

¹⁰⁶ 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 41.

¹⁰⁷ 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>, attached as Exhibit 42; 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, attached as Exhibit 43.

¹⁰⁸ Wyoming Nonattainment Analysis, *supra* n.107, at viii (Exhibit 43).

¹⁰⁹ EPA, *Daily Ozone AQI Levels in 2011 for Sublette County, Wyoming*, available at http://www.epa.gov/cgi-bin/broker?msaorcountyName=countycode&msaorcountyValue=56035&poll=44201&county=56035&msa=-1&sy=2011&flag=Y&_debug=2&_service=data&_program=dataprog.trend_tile_dm.sas, attached as Exhibit 44; 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>, attached as Exhibit 45.

¹¹⁰ See, e.g., 2011 DEQ Ozone Advisories, Pinedale Online! (Mar. 17, 2011), <http://www.pinedaleonline.com/news/2011/03/OzoneCalendar.htm> (documenting ten ozone advisories in February and March 2011), attached as Exhibit 46; Wyoming Department of Environmental Quality, Ozone Advisory for Monday, Feb. 28, Pinedale Online! (Feb. 27, 2011), <http://www.pinedaleonline.com/news/2011/02/OzoneAdvisoryforMond.htm>, attached as Exhibit 47.

standard.¹¹¹ 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.¹¹² 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.¹¹³

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.¹¹⁴ Moreover, significant additional drilling has occurred since 2008. Colorado is now home to more than 46,000 wells.¹¹⁵ 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.¹¹⁶ 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.¹¹⁷

VOC and NO_x 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 lands¹¹⁸ – are likely to be impacted by increased ozone pollution as a result of oil and gas development in the Rocky Mountain region. Affected areas include Mesa Verde National Park and Weminuche Wilderness Area in Colorado and San Pedro Parks Wilderness Area, Bandelier Wilderness Area, Pecos Wilderness Area, and Wheeler Peak

¹¹¹ Scott Streater, *Air Quality Concerns May Dictate Uintah Basin's Natural Gas Drilling Future*, N.Y. TIMES, Oct. 1, 2010, available at <http://www.nytimes.com/gwire/2010/10/01/01greenwire-air-quality-concerns-may-dictate-uintah-basins-30342.html>, attached as Exhibit 48.

¹¹² See EPA, AirExplorer, Query Concentrations (Ozone, Uintah County, 2011), available through the <http://www.epa.gov/airexplorer/> website and attached as Exhibit 49.

¹¹³ BLM, *GASCO Energy Inc. Uinta Basin Natural Gas Development Draft Environmental Impact Statement* (“GASCO DEIS”), at 3-13, available at http://www.blm.gov/ut/st/en/fo/vernal/planning/nepa/_gasco_energy_eis.html, attached as Exhibit 50.

¹¹⁴ 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 51.

¹¹⁵ 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), attached as Exhibit 52.

¹¹⁶ 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>, attached as Exhibit 53.

¹¹⁷ Myers et al., *The Association Between Ambient Air Quality Ozone Levels and Medical Visits for Asthma in San Juan County* (Aug. 2007), available at <http://www.nmenv.state.nm.us/aqb/4c/Documents/SanJuanAsthmaDocBW.pdf>, attached as Exhibit 54.

¹¹⁸ See 42 U.S.C. § 7472(a).

Wilderness Area in New Mexico.¹¹⁹ These areas are all near concentrated oil and gas development in the San Juan Basin.¹²⁰

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.¹²¹

Moreover, VOCs are not simply ozone precursors. They are also co-emitted with a stew “hazardous air pollutants” (HAPs) including benzene. HAPs, by definition, are toxic and also may be carcinogenic. High levels of carcinogens, including benzene compounds, are associated with gas production sites. Unsurprisingly, recent risk assessments from Colorado document elevated health risks for residents living near gas wells.¹²² Indeed, levels of benzene and other toxics near wells in rural Colorado were “higher than levels measured at 27 out of 37 EPA air toxics monitoring sites ... including urban sites” in major industrial areas.”¹²³ These pollution levels are even more concerning than these high concentrations would suggest because several of the toxics emitted by gas operations are endocrine disruptors, which are compounds known to harm human health by acting on the endocrine system even at very low doses; some such compounds may, in fact, be especially dangerous specifically at the low, chronic, doses one would expect near gas operations.¹²⁴

Sulfur dioxide: Oil and gas production also emits sulfur dioxide, primarily from natural gas processing plants.¹²⁵ Sulfur dioxide is released as part of the sweetening process, which removes hydrogen sulfide from the gas.¹²⁶ Sulfur dioxide is also created when gas containing hydrogen sulfide (discussed below) is combusted in boilers or heaters.¹²⁷

¹¹⁹ Rodriguez et al., *Regional Impacts of Oil and Gas Development on Ozone Formation in the Western United States*, 59 *Journal of the Air and Waste Management Association* 1111 (Sept. 2009), available at http://www.wrapair.org/forums/amc/meetings/091111_Nox/Rodriguez_et_al_OandG_Impacts_JAWMA9_09.pdf, attached as Exhibit 55.

¹²⁰ *Id.* at 1112.

¹²¹ See Kembball-Cook et al., *Ozone Impacts of Natural Gas development in the Haynesville Shale* 44 *Environ. Sci. Technol.* 9357, 9362 (2010), attached as Exhibit 56.

¹²² McKenzie, *supra* n.91.

¹²³ *Id.* at 5.

¹²⁴ See L. Vandenberg et al., *Hormones and Endocrine-Disrupting Chemicals: Low-Dose Effects and Nonmonotonic Dose Responses*, *Endocrine Disruption Review* (2012), attached as Exhibit 57.

¹²⁵ 76 Fed. Reg., *supra* n.93, at 52,756.

¹²⁶ 2011 TSD, *supra* n.87, at 3-3 to 3-5.

¹²⁷ 76 Fed. Reg., *supra* n.93, at 52,756.

Hydrogen sulfide: Some natural gas contains hydrogen sulfide. Gas containing hydrogen sulfide above a specific threshold is classified as “sour gas.”¹²⁸ According to EPA, there are 14 major areas in the U.S., found in 20 different states, where natural gas tends to be sour.¹²⁹ All told, between 15 and 20% of the natural gas in the U.S. may contain hydrogen sulfide.¹³⁰

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.”¹³¹ Hydrogen sulfide may be emitted during all stages of development, including exploration, extraction, treatment and storage, transportation, and refining.¹³² For example, hydrogen sulfide is emitted as a result of leaks from processing systems and from wellheads in sour gas fields.¹³³

Hydrogen sulfide emissions from the oil and gas industry are concerning because this pollutant may be harmful even at low concentrations.¹³⁴ 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.¹³⁵ Although hydrogen sulfide was originally included in the Clean Air Act's list of hazardous air pollutants, it was removed with industry support.¹³⁶

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 example, North Dakota reported 3,300 violations of an odor-based hydrogen sulfide standard around drilling wells.¹³⁷ People in northwest New Mexico and western Colorado living near gas wells have long complained of strong odors, including

¹²⁸ *Id.* at 52,756. Gas is considered “sour” if hydrogen sulfide concentration is greater than 0.25 grain per 100 standard cubic feet, along with the presence of carbon dioxide. *Id.*

¹²⁹ 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 (1993) (hereinafter “EPA Hydrogen Sulfide Report”), attached as Exhibit 58.

¹³⁰ Lana Skrtic, *Hydrogen Sulfide, Oil and Gas, and People's Health* (“Skrtic Report”), at 6 (May 2006), available at http://www.earthworksaction.org/pubs/hydrogensulfide_oilgas_health.pdf, attached as Exhibit 59.

¹³¹ EPA Hydrogen Sulfide Report, *supra* n. 129, at III-35.

¹³² *Id.* at ii.

¹³³ 2011 TSD, *supra* n.87, at 2-3.

¹³⁴ See James Collins & David Lewis, Report to CARB, *Hydrogen Sulfide: Evaluation of Current California Air Quality Standards with Respect to Protections of Children* (2000), available at <http://oehha.ca.gov/air/pdf/oehhah2s.pdf>, attached as Exhibit 60.

¹³⁵ EPA Hydrogen Sulfide Report, *supra* n. 129, at ii.

¹³⁶ See Pub. L. 102-187 (Dec. 4, 1991). We do not concede that this removal was appropriate. Hydrogen sulfide meets section 112 of the Clean Air Act's standards for listing as a hazardous air pollutant and should be regulated accordingly.

¹³⁷ EPA Hydrogen Sulfide Report, *supra* n. 129, at III-35.

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.¹³⁸ 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.¹³⁹

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.¹⁴⁰ 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}.¹⁴¹

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.¹⁴² These elevated levels of PM_{2.5} have been linked to oil and gas activities in the Uinta Basin.¹⁴³ Modeling also shows that road traffic associated with energy development is pushing PM₁₀ levels very close to violating NAAQS standards.¹⁴⁴

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

Although EPA's recently finalized new source performance standards and standards for hazardous air pollutants¹⁴⁵ do reduce some of these pollution problems, they will not solve them. First, the rules do not even address some pollutants, including NO_x, methane, and hydrogen sulfide, so any reductions of these pollutants occur only as co-benefits of the VOC reductions that the rules require.¹⁴⁶ Second, the rules do not control emissions from most transmission infrastructure.¹⁴⁷ Third, existing sources of air pollution are not controlled for any pollutant, meaning that increased use of existing infrastructure will produce emissions uncontrolled by the rules. Fourth, without full

¹³⁸ See Global Community Monitor, *Gassed! Citizen Investigation of Toxic Air Pollution from Natural Gas Development*, at 11-14 (2011), attached as Exhibit 61.

¹³⁹ *Id.* at 21.

¹⁴⁰ See BLM, GASCO Energy Inc. Uinta Basin Natural Gas Development Project Draft Environmental Impact Statement, at App. J at 2 (Oct. 2010) ("GASCO DEIS").

¹⁴¹ O&G NSPS RIA, *supra* n.43, at 4-18.

¹⁴² GASCO DEIS, *supra* n.140, at 3-12.

¹⁴³ West Tavaputs FEIS, *supra* n.59, at 3-20.

¹⁴⁴ See GASCO DEIS, *supra* n.140, at 4-27.

¹⁴⁵ See EPA, Oil and Natural Gas Sector: New Source Performance Standards and National Emission Standards for Hazardous Air Pollutants, 77 Fed. Reg. 49,490 (Aug. 16, 2012), available at <http://www.gpo.gov/fdsys/pkg/FR-2012-08-16/pdf/2012-16806.pdf>.

¹⁴⁶ See *id.* at 49,513-14.

¹⁴⁷ See, e.g., *id.* at 49,523.

enforcement, the rules will not reduce emissions completely. Fifth, 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.

Trunkline Itself Will Induce Significant Production-related Air Emissions

As we have discussed above, Trunkline proposes to export about 2 bcf/d of natural gas, and will demand an additional 10% of this gas for operation of on-site equipment. Thus, Trunkline's proposal would create roughly 803 bcf/year of new gas demand. The EIA predict that about 63% of this export will come from new production, totaling 506 bc/f year. EPA conversion factors allow us to estimate the emissions impacts of this new production. EPA's current greenhouse gas inventory implies that about 1.5% of gross gas production leaks to the atmosphere in one way or another.¹⁴⁸ EPA's emissions estimates are based on industry's self-reported data and assumed emission factors, and there is reason to suspect that these estimates are too low. For example, recent work by National Oceanic and Atmospheric Administration ("NOAA") scientists based on direct measurement at gas fields, suggests that this leak rate may be actually between 4.8% and 9%, at least in some fields.¹⁴⁹ These leak rates, and EPA conversion factors between the typical volumes of methane, VOC, and HAP in natural gas,¹⁵⁰ make it possible to calculate the potential impact of increasing gas production in the way that LNG export would require.

The table below uses these conversion factors to calculate the emissions associated with producing 506 bcf/year of new gas demand, the likely inducement specifically attributable to Trunkline. We calculate for a 1% leak rate (which is below the current value, but is included as a conservative case to reflect successful air pollution controls more extensive than those which EPA has promulgated), the current EPA estimated rate

¹⁴⁸ EPA's 2013 inventory does not explicitly state the leak rate for natural gas production. EPA, *Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990-2011*, Table ES-2 (2013), attached as Exhibit 62. EPA's prior inventory implied a leak rate of 2.4%, as extrapolated by a previous study. Alvarez *et al.*, *Greater focus needed on methane leakage from natural gas infrastructure*, Proceedings of the National Academy of Science (Apr. 2012) at 1, attached as Exhibit 63. Because the current inventory's sector-wide emissions estimates for the same time periods have been reduced by roughly 1/3, the current inventory implies a leak rate of roughly 1.5%.

¹⁴⁹ See G. Petron *et al.*, *Hydrocarbon emissions characterization in the Colorado Front*, *supra* n.88; J. Tollefson, *Methane leaks erode green credentials of natural gas*, *supra* n.90.

¹⁵⁰ See 2011 TSD, *supra* n.87, at Table 4.2. EPA calculated average composition factors for gas from well completions. These estimates, which are based on a range of national data are robust, but necessarily imprecise for particular fields and points along the line from wellhead to LNG terminal. Nonetheless, they provide a beginning point for quantitative work. EPA's conversions are: 0.0208 tons of methane per mcf of gas; 0.1459 lb VOC per lb methane; and 0.0106 lb HAP per lb methane.

of 1.5%, and the higher leak rates the NOAA studies suggest, generating results for methane, VOC, and HAP.¹⁵¹

Table 1: Emissions Associated with Production of 506 bcf/y of Natural Gas

Leak Rate	Methane (tons)	VOC (tons)	HAP (tons)
1%	105,248	15,356	1,116
1.50%	157,872	23,034	1,673
4.80%	505,190	73,707	5,355
9%	947,232	138,201	10,041

Thus, Trunkline, alone, would be responsible for tens of thousands of tons of increased air pollution. Notably, the threshold for major source permitting under the Clean Air Act is generally just tens of tons of pollution; for greenhouse gases, it is generally 75,000 tons. Trunkline would thus greatly increase air pollution in the regions from which it draws its gas, imperiling public health and the global climate.

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, “[w]ell 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.”¹⁵² New York’s Department of Environmental Conservation reached similar estimates.¹⁵³ After initial

¹⁵¹ These figures were calculated by multiplying the volume of gas to be exported (in bcf) by 1,000,000 to convert to mcf, and then by 63% to generate new production volumes. The new production volumes of gas were, in turn, multiplied by the relevant EPA conversion factors to generate tonnages of the relevant pollutants. These results are approximations: Although we reported the arithmetic results of this calculation, of course only the first few significant figures of each value should be the focus.

¹⁵² TNC, Pennsylvania Energy Impacts Assessment, Report 1: Marcellus Shale Natural Gas and Wind 10, 18 (2010), attached as Exhibit 64.

¹⁵³ N.Y. Dep’t of Env’tl. Conservation, Revised Draft Supplemental General Environmental Impact Statement on the Oil, Gas and Solution Mining Regulatory Program, 5-5 (2011) (“NY RDSGEIS”), available at <http://www.dec.ny.gov/energy/75370.html>.

drilling is completed the well pad is partially 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.¹⁵⁴ 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.¹⁵⁵

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.”¹⁵⁶ “Research has shown measureable impacts often extend at least 330 feet (100 meters) into forest adjacent to an edge.”¹⁵⁷

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

¹⁵⁴ *Id.* at 6-13.

¹⁵⁵ *Id.* at 6-68.

¹⁵⁶ Pennsylvania Energy Impacts Assessment, *supra* n.152, at 10.

¹⁵⁷ NY RDSGEIS, *supra* n.153, at 6-75.

- 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.¹⁵⁸

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 on them. Although TNC adds that impacts could be reduced with proper planning,¹⁵⁹ more development makes mitigation more difficult. Indeed, the Pennsylvania Department of Conservation and Natural Resources recently concluded that “zero” remaining acres of the state forests are suitable for leasing with surface disturbing activities, or the forests will be significantly degraded.¹⁶⁰

These land disturbance effects will harm rural economies and decrease property values, as major gas infrastructure transforms and distorts the existing landscape. They will also

¹⁵⁸ Pennsylvania Energy Impacts Assessment, *supra* n.152, at 29.

¹⁵⁹ *See id.*

¹⁶⁰ Penn. Dep’t of Conservation and Natural Resources, Impacts of Leasing Additional State Forest for Natural Gas Development (2011), attached as Exhibit 65.

harm endangered species in regions where production would increase in response to Trunkline's exports. Harm to these species and their habitat is inconsistent with the profound public interest in land and species conservation, as expressed in the Endangered Species Act and similar statutes.

iii. Gas Production Poses Risks to Ground and Surface Water

As noted above, most of the increased production that would result from Trunkline's proposal will likely be from shale and other unconventional gas sources, and producing gas from these sources requires hydraulic fracturing, or fracking.¹⁶¹ Hydraulic fracturing involves injecting a base fluid (typically water),¹⁶² sand or other proppant, and various fracturing chemicals into the gas-bearing formation at high pressures to fracture the rock and release additional gas. Each step of this process presents a risk to water resources. Withdrawal of the water may overtax the water source. Fracking itself may contaminate groundwater with either chemicals added to the fracturing fluid or with naturally occurring chemicals mobilized by fracking. After the well is fracked, some water will return to the surface, composed of both fracturing fluid and naturally occurring "formation" water. This water, together with drilling muds and drill cuttings, must be disposed of without further endangering water resources.

Water Withdrawals

Fracking requires large quantities of water. The precise amount of water varies by the shale formation being fracked. The amount of water varies by well and by formation. For example, estimates of water needed to frack a Marcellus Shale wells range from 4.2 to over 7.2 million gallons.¹⁶³ In the Gulf States' shale formations (Barnett, Haynesville, Bossier, and Eagle Ford), fracking a single well requires from 1 to over 13 million gallons of water, with averages between 4 and 8 million gallons.¹⁶⁴ Fresh water constitutes 80% to 90% of the total water used to frack a well even where operators recycle "flowback"

¹⁶¹ See DOE, Shale Gas Production Subcommittee First 90-Day Report, *supra* n.86, at 8.

¹⁶² 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.

¹⁶³ TNC, Pennsylvania Energy Impacts Assessment, *supra* n.152, at 10, 18; *accord* NY RDSGEIS, *supra* n.153, at 6-10 ("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."). Other estimates suggest 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 66 ("Comment on NY RDSGEIS").

¹⁶⁴ Jean-Philippe Nicot, *et al.*, *Draft Report – Current and Projected Water Use in the Texas Mining and Oil and Gas Industry*, 52-54 (Feb. 2011) (water use from 1 to over 13 million gallons), attached as Exhibit 67; Jean-Philippe Nicot, *et al.*, *Oil & Gas Water Use in Texas: Update to the 2011 Mining Water Use Report* 11-14 (Sept. 2012) (updated data presented as averages), attached as Exhibit 68. DOE's Shale Gas Subcommittee generally states that nationwide, fracking an individual well requires between 1 and 5 million gallons of water. DOE, Shale Gas Production Subcommittee First 90-Day Report, *supra* n.86, at 19.

water from the fracking of previous wells for use in drilling the current one.¹⁶⁵ Many wells are fractured multiple times over their productive life.

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.¹⁶⁶ Even when flow reductions are not themselves problematic, the intake structures can harm aquatic organisms.¹⁶⁷ Where water is withdrawn from aquifers, rather than surface sources, withdrawal may cause permanent depletion of the source. This risk is even more prevalent with withdrawals for fracking than it is for other withdrawals, because fracking is a consumptive use. Fluid injected during the fracking process is (barring accident) deposited below freshwater aquifers and into sealed formations.¹⁶⁸ 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.

Groundwater Contamination

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 via the fracking process. Contamination may occur through several methods, including where the well casing fails or where the fractures created through drilling intersect an existing, 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.¹⁶⁹ Chemicals are added as solvents, surfactants, friction reducers, gelling agents, bactericides, and for other purposes.¹⁷⁰ New York recently identified 322 unique ingredients used in fluid additives, recognizing that this constituted a partial list.¹⁷¹ These chemicals include petroleum distillates; aromatic hydrocarbons; glycols; glycol ethers; alcohols and aldehydes; amides; amines; organic acids, salts, esters and related

¹⁶⁵ NY RDSGEIS, *supra* n.153, at 6-13; *accord* Nicot 2012, *supra* n.164, at 54.

¹⁶⁶ NY RDSGEIS, *supra* n.153, at 6-3 to 6-4, *see also* Maya Weltman-Fahs, Jason M. Taylor, *Hydraulic Fracturing and Brook Trout Habitat in the Marcellus Shale Region: Potential Impacts and Research Needs*, 38 *Fisheries* 4, 6-7 (Jan. 2013), attached as Exhibit 69.

¹⁶⁷ NY RDSGEIS, *supra* n.153, at 6-4.

¹⁶⁸ *Id.* at 6-5; First 90-Day Report, *supra* n.86, at 19 (“[I]n some regions and localities there are significant concerns about consumptive water use for shale gas development.”).

¹⁶⁹ NY RDSGEIS, *supra* n.153, at 5-40.

¹⁷⁰ *Id.* at 5-49.

¹⁷¹ *Id.* at 5-41.

chemicals; microbicides; and others. Many of these chemicals present health risks.¹⁷² 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.¹⁷³ The minority staff of the House Committee on Energy and Commerce has 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."¹⁷⁴

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."¹⁷⁵ 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.¹⁷⁶

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.¹⁷⁷ 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 isolates 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.¹⁷⁸

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.¹⁷⁹ One

¹⁷² *Id.* at 5-75 to 5-78.

¹⁷³ DOE, Shale Gas Production Subcommittee First 90-Day Report, *supra* n.86, at 25.

¹⁷⁴ Natural Resources Defense Council, Earthjustice, and Sierra Club, Comments [to EPA] on Permitting Guidance for Oil and Gas Hydraulic Fracturing Activities Using Diesel Fuels 3, (June 29, 2011) (quoting Letter from Reps. Waxman, Markey, and DeGette to EPA Administrator Lisa Jackson 1 (Jan. 31, 2001)) ("Comment on Diesel Guidance"), attached as Exhibit 70.

¹⁷⁵ Shale Gas Production Subcommittee First 90-Day Report, *supra* n.86, at 21; *see also* Comment on NY RDSGEIS, *supra* n.163, attachment 3, Report of Glen Miller, at 2.

¹⁷⁶ Comment on NY RDSGEIS, *supra* n.163, attachment 1, Report of Susan Harvey, at 92.

¹⁷⁷ DOE, Shale Gas Production Subcommittee First 90-Day Report, *supra* n.86, at 20.

¹⁷⁸ Comment on Diesel Guidance, *supra* n.174, at 5-9.

¹⁷⁹ Comment on NY RDSGEIS, *supra* n.163, attachment 3, Report of Tom Myers, at 12-15.

recent study concluded, on the basis of geologic modeling, that frack fluid may migrate from the hydraulic fracture zone to freshwater aquifers in less than ten years.¹⁸⁰

Available empirical data indicates that fracking has resulting in groundwater contamination in at least five documented instances. One study “documented the higher concentration of methane originating in shale gas deposits . . . into wells surrounding a producing shale production site in northern Pennsylvania.”¹⁸¹ By tracking certain isotopes of methane, this study – which the DOE Subcommittee referred to as “a recent, credible, peer-reviewed study” determined that the methane originated in the shale deposit, rather than from a shallower source.¹⁸² Two other reports “have documented or suggested the movement of fracking fluid from the target formation to water wells linked to fracking in wells.”¹⁸³ “Thyne (2008)[¹⁸⁴] had found bromide in wells 100s of feet above the fracked zone. The EPA (1987)[¹⁸⁵] 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.”¹⁸⁶

More recently, EPA has investigated groundwater contamination in Pavillion, Wyoming and Dimock, Pennsylvania. In the Pavillion investigation, 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.”¹⁸⁷ 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

¹⁸⁰ Tom Myers, *Potential Contaminant Pathways from Hydraulically Fractured Shale to Aquifers* (Apr. 17, 2012), attached as Exhibit 71.

¹⁸¹ DOE, Shale Gas Production Subcommittee First 90-Day Report at 20 (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), attached as Exhibit 72).

¹⁸² *Id.*

¹⁸³ Comment on NY RDSGEIS, *supra* n.163, attachment 3, Report of Tom Myers, at 13.

¹⁸⁴ Dr. Myers relied on Geoffrey Thyne, *Review of Phase II Hydrogeologic Study* (2008), prepared for Garfield County, Colorado, available at [http://cogcc.state.co.us/Library/Presentations/Glenwood_Spgs_HearingJuly_2009/\(1_A\)_ReviewofPhase-II-HydrogeologicStudy.pdf](http://cogcc.state.co.us/Library/Presentations/Glenwood_Spgs_HearingJuly_2009/(1_A)_ReviewofPhase-II-HydrogeologicStudy.pdf).

¹⁸⁵ Environmental Protection Agency, *Report to Congress, Management of Wastes from the Exploration, Development, and Production of Crude Oil, Natural Gas, and Geothermal Energy*, vol. 1 (1987), available at nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=20012D4P.txt, attached as Exhibit 73.

¹⁸⁶ Comment on NY RDSGEIS, *supra* n.163, attachment 3, Report of Tom Myers, at 13.

¹⁸⁷ EPA, Draft Investigation of Ground Water Contamination near Pavillion, Wyoming, at xiii (2011), available at http://www.epa.gov/region8/superfund/wy/pavillion/EPA_ReportOnPavillion_Dec-8-2011.pdf, attached as Exhibit 74. EPA has not yet released a final version of this report, instead recently extending the public comment period to September 30, 2013. 78 Fed. Reg. 2396 (Jan. 11, 2013).

diesel range organics) at levels higher than expected.¹⁸⁸ At shallower levels, EPA detected “high concentrations of benzene, xylenes, gasoline range organics, diesel range organics, and total purgeable hydrocarbons.”¹⁸⁹ 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.¹⁹⁰ The U.S. Geological Survey, in cooperation with the Wyoming Department of Environmental Quality, also provided data regarding chemicals found in wells surrounding Pavillion.¹⁹¹ Although the USGS did not provide analysis regarding the likely source of the contaminants found, an independent expert who reviewed the USGS and EPA data at the request of Sierra Club and other environmental groups concluded that the USGS data supports EPA’s findings.¹⁹²

EPA also identified elevated levels of hazardous substances in home water supplies near Dimock, Pennsylvania.¹⁹³ EPA’s initial assessment concluded that “a number of home wells in the Dimock area contain hazardous substances, some of which are not naturally found in the environment,” including arsenic, barium, bis(2(ethylhexyl)phthalate, glycol compounds, manganese, phenol, and sodium.¹⁹⁴ Arsenic, barium, and manganese were present in five home wells “at levels that could present a health concern.”¹⁹⁵ Many of these chemicals, including arsenic, barium, and manganese, are hazardous substances as defined under CERCLA section 101(14). See 42 U.S.C. § 9604(a); 40 C.F.R. § 302.4. EPA’s assessment was based in part 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.”¹⁹⁶ The PADEP information provided reason to believe that drilling

¹⁸⁸ *Id.* at xii.

¹⁸⁹ *Id.* at xi.

¹⁹⁰ *Id.* at xi, xiii.

¹⁹¹ USGS, *Groundwater-Quality and Quality-Control Data for two Monitoring Wells near Pavillion, Wyoming, April and May 2012*, USGS Data Series 718 p.25 (2012), attached as Exhibit 75.

¹⁹² Tom Myers, *Assessment of Groundwater Sampling Results Completed by the U.S. Geological Survey* (Sept. 30, 2012), attached as Exhibit 76. Another independent expert, Rob Jackson of Duke University, has stated that the USGS and EPA data is “suggestive” of fracking as the source of contamination. Jeff Tollefson, *Is Fracking Behind Contamination in Wyoming Groundwater?*, *Nature* (Oct. 4, 2012), attached as Exhibit 77. See also Tom Myers, *Review of DRAFT: Investigation of Ground Water Contamination near Pavillion Wyoming* (April 30, 2012) (concluding that EPA’s initial study was well-supported), attached as Exhibit 78.

¹⁹³ EPA Region III, Action Memorandum - Request for Funding for a Removal Action at the Dimock Residential Groundwater Site (Jan. 19, 2012), available at <http://www.epaos.org/sites/7555/files/Dimock%20Action%20Memo%2001-19-12.PDF>, attached as Exhibit 79; EPA, *EPA Completes Drinking Water Sampling in Dimock, Pa.* (Jul. 25, 2012), attached as Exhibit 80.

¹⁹⁴ EPA Region III Action Memorandum, *supra* n.193, at 1, 3-4.

¹⁹⁵ *EPA Completes Drinking Water Sampling in Dimock, Pa.*, *supra* n.193.

¹⁹⁶ EPA Region III Action Memorandum, *supra* n.193, at 1.

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. Shortly thereafter methane contamination was detected in private well water. The drilling also caused several surface spills. Although EPA ultimately concluded that the five homes with potentially unsafe levels of hazardous substances had water treatment systems sufficient to mitigate the threat,¹⁹⁷ the Dimock example indicates the potential for gas development to contaminate groundwater.

The serious groundwater contamination problems experienced at the Pavillion and Dimock sites demonstrate a possibility of contamination, and attendant human health risks. Such risks are not uncommon in gas field sites, and will be intensified by production for export. DOE/FE must account for these risks, as well, in its economic evaluation.

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). Because these wastes contain the same contaminants described in the preceding section, environmental hazards can arise from their management and ultimate disposal.

On site, drilling mud, drill cuttings, flowback and produced water are often stored in pits. Open pits can have harmful air emissions, can leach into shallow groundwater, and can fail and result in surface discharges. Many of these harms can be minimized by the use of seal tanks in a “closed loop” system.¹⁹⁸ Presently, only New Mexico mandates the use of closed loop waste management systems, and pits remain in use elsewhere.

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.

Underground injection wells present risks of groundwater contamination similar to those identified above for fracking itself. Gas production wastes are not categorized as

¹⁹⁷ EPA Completes Drinking Water Sampling in Dimock, Pa., *supra* n.193.

¹⁹⁸ See, e.g., NY RDSGEIS, *supra* n.153, at 1-12.

hazardous under the Safe Drinking Water Act, 42 U.S.C. § 300f *et seq.*, and may be disposed of in Class II injection wells. Class II wells are brine wells, and the standards and safeguards in place for these wells were not designed with the contaminants found in fracking wastes in mind.¹⁹⁹

Additionally, underground injection of fracking wastes appears to have induced earthquakes in several regions. For example, underground injection of fracking waste in Ohio has been correlated with earthquakes as high as 4.0 on the Richter scale.²⁰⁰ Underground injection may cause earthquakes by causing movement on existing fault lines: “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.”²⁰¹ 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.”²⁰² In light of the apparent induced seismicity, Ohio has put a moratorium on injection in the affected region. Similar associations between earthquakes and injection have occurred in Arkansas, Texas, Oklahoma and the United Kingdom.²⁰³ In light of these effects, Ohio and Arkansas have placed moratoriums on injection in the affected areas.²⁰⁴ The recently released abstract of a forthcoming United States Geological Survey study affirms the connection between disposal wells and earthquakes.²⁰⁵

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:

¹⁹⁹ See 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), attached as Exhibit 81.

²⁰⁰ Columbia University, Lamont-Doherty Earth Observatory, Ohio Quakes Probably Triggered by Waste Disposal Well, Say Seismologists (Jan. 6, 2012), available at <http://www.ldeo.columbia.edu/news-events/seismologists-link-ohio-earthquakes-waste-disposal-wells>, attached as Exhibit 82.

²⁰¹ *Id.*

²⁰² *Id.*

²⁰³ *Id.*; see also Alexis Flynn, Study Ties Fracking to Quakes in England, Wall Street Journal (Nov. 3, 2011), available at <http://online.wsj.com/article/SB10001424052970203804204577013771109580352.html>, attached as Exhibit 83.

²⁰⁴ Lamont-Doherty Earth Observatory; Arkansas Oil and Gas Commission, Class II Commercial Disposal Well or Class II Disposal Well Moratorium (Aug. 2, 2011), available at <http://www.aogc.state.ar.us/Hearing%20Orders/2011/July/180A-2-2011-07.pdf>, attached as Exhibit 84.

²⁰⁵ Ellsworth, W. L., et al., Are Seismicity Rate Changes in the Midcontinent Natural or Manmade?, Seismological Society of America, (April 2012), available at http://www2.seismosoc.org/FMPro?-db=Abstract_Submission_12&-recid=224&-format=%2Fmeetings%2F2012%2Fabstracts%2Fsessionabstractdetail.html&-lay=MtgList&-find, attached as Exhibit 85.

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.²⁰⁶

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.²⁰⁷

3. Other Nationwide and Global Environmental Impacts

a. Changes in Domestic Power Production

Trunkline's export proposal will further increase air pollution by increasing the amount of coal used for domestic electricity production. The EIA Export Study predicts that exports, by causing natural gas prices to rise, will drive more electricity generation to coal than to renewable energy. According to the EIA, the power sector will "primarily" respond to higher natural gas prices by shifting to coal-fired generation, and only

²⁰⁶ Comment on NY RDSGEIS, *supra* n.163, attachment 3, Report of Glen Miller, at 13.

²⁰⁷ *Id.* at 4.

secondarily to renewable sources.²⁰⁸ Specifically, EIA predicts that 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).²⁰⁹

The shift from gas- to coal-fired electricity generation will increase emissions of both traditional air pollutants and greenhouse gases. Gas-fired power plants generate less than a third of the nitrogen oxides and one percent of the sulfur oxides that coal-fired plants generate.²¹⁰ Thus, the EIA Export Study demonstrates that exports will harm the local environment by causing the opposite shift here.²¹¹

Coal-fired plants also release roughly twice the carbon dioxide combustion emissions as gas-fired plants, although, as discussed in the following section, some of this combustion advantage is offset by the greenhouse gas emissions resulting from gas production. Accordingly, the price increase and corresponding shift to coal-fired power generation risks increasing greenhouse gas pollution. The *EIA Export Study* concluded that under every scenario modeled, exports would produce a significant increase in domestic greenhouse gas emissions, as illustrated by the table below. As we explain in the following section, however, the comparative life-cycle emissions of natural gas and coal are uncertain. Before authorizing a fundamental change in domestic energy markets, DOE/FE should seek out or commission efforts to resolve this uncertainty.

²⁰⁸ EIA Export Study, *supra* n.3, at 6; *see also id.* at 17 (“[H]igher natural gas prices lead electric generators to burn more coal and less natural gas.”).

²⁰⁹ *Id.* at 18.

²¹⁰ EPA, Air Emissions, <http://www.epa.gov/cleanenergy/energy-and-you/affect/air-emissions.html> (last visited Dec. 12, 2012), attached as Exhibit 86.

²¹¹ The NERA report did not examine shifts within the domestic power sector in detail, and the NERA study authors acknowledge that EIA uses a more sophisticated model that is better able to predict electricity sector responses to gas prices. The NERA report explains that “EIA’s NEMS model has a detailed bottom-up representation of the electricity sector, while the electricity sector in the NERA model is a nested CES function with limited technologies. This means that NEMS allows for switching from natural gas-based generation to other technology types easily, while the possibility of switching out of natural gas is more limited and controlled in the NERA model.” NERA Study, *supra* n.3, at 207 (appx. D, figs. 176-78 and accompanying text). Thus, although the NERA study predicts a smaller electricity sector response to gas prices than did the EIA, *id.*, DOE/FE should rely on the more sophisticated EIA predictions.

Table 2: Cumulative CO₂ Emissions from 2015 to 2035 With Various Export Scenarios²¹²

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 domestic 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.²¹³ 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.²¹⁴ 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,²¹⁵ is not in the public interest.

b. Effects on Global Greenhouse Gas Emissions

²¹² From the *EIA Export Study*, *supra* n.3, at 19.

²¹³ Standards of Performance for Greenhouse Gas Emissions for New Stationary Sources: Electric Utility Generating Units, 77 Fed. Reg. 22,392 (Apr. 13, 2012).

²¹⁴ *See id.* at 22,430.

²¹⁵ *See* Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act, 74 Fed. Reg. 66,496 (Dec. 15, 2009).

Although domestic substitution of coal for gas in response to exports will harm the public interest, DOE/FE must reject Trunkline's unsupported assertion that the reverse holds true for countries that receive U.S. LNG. That is, Trunkline argues that exports can provide an environmental benefit by helping receiving countries switch away from coal and oil as fossil fuels, reducing global greenhouse gas emissions. App. at 21-22. The available evidence indicates that such a benefit is unlikely. Trunkline's argument is wrong for three reasons.

First, importing countries may not use LNG in place of coal or other dirty fuels. The International Energy Agency (IEA) concludes that increased use of natural gas is unlikely to reduce global greenhouse gas emissions. The IEA's recent *Golden Rules for a Golden Age of Gas* report predicts that international trade in LNG and other measures to increase global availability of natural gas will lead many countries to use natural gas in place of wind, solar, or other renewables, displacing these more environmentally beneficial energy sources instead of displacing other fossil fuels, and that these countries may also increase their overall energy consumption beyond the level that would occur with exports.²¹⁶ In the United States alone, the IEA expects the gas boom to result in a 10% reduction in renewables relative to a baseline world without increased gas use and trade.²¹⁷ The IEA goes on to conclude that high levels of gas production and trade will produce "only a small net shift" in global greenhouse gas emissions, with atmospheric CO₂ levels stabilizing at over 650 ppm and global warming in excess of 3.5 degrees Celsius, "well above the widely accepted 2°C target."²¹⁸ Another recent study, prepared by the Joint Institute for Strategic Energy Analysis (JISEA), also modeled power sector futures resulting from increasing U.S. reliance on natural gas.²¹⁹ That study likewise found that, under baseline assumptions for future electricity demand and policy measures, "natural gas and coal swap positions compared to their historical levels," with wind energy growing at a rate that represents "a significant reduction from deployment in recent years;" as a result, CO₂ emissions "do not begin to transition to a trajectory that many scientists believe is necessary to avoid dangerous impacts from climate change."²²⁰

Second, even where importing countries do substitute gas for coal or fuel oil, this substitution is likely to cause little, if any, reduction in global greenhouse gas emissions. One reason for this is that LNG has life-cycle emissions that are significantly higher than

²¹⁶ International Energy Agency, *Golden Rules for a Golden Age of Gas*, Ch. 2 p. 91 (2012), available at http://www.iea.org/publications/freepublications/publication/WEO2012_GoldenRulesReport.pdf, attached as Exhibit 87.

²¹⁷ *Id.* at 80.

²¹⁸ *Id.*

²¹⁹ Jeffrey Logan et al., Joint Inst. for Strategic Analysis, *Natural Gas and the Transformation of the U.S. Energy Sector* (2012) ("JISEA report"), available at <http://www.nrel.gov/docs/fy13osti/55538.pdf>, attached as Exhibit 88

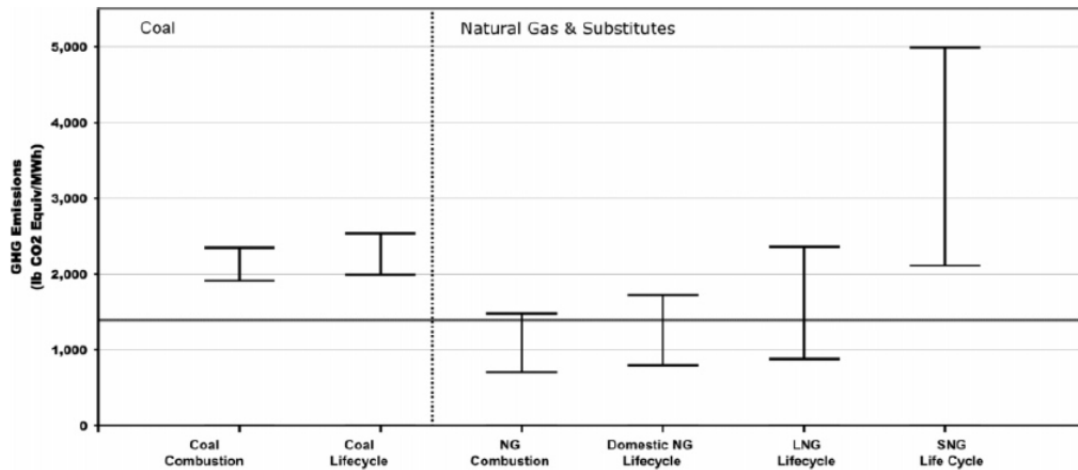
²²⁰ *Id.* at 98.

other sources of natural gas. Liquefying natural gas is an energy intensive process. 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 through the use of heat generated by the burning of yet more natural gas. Paulina Jaramillo *et al.* have estimated that these operations drastically increase the lifecycle greenhouse gas emissions of LNG, adding between 13.85 and 51.7 pounds of CO₂e per MMBtu to gas's combustion emissions of 120 pounds of CO₂e per MMBtu and gas's other sources of lifecycle emissions.²²¹ Jaramillo's more narrow estimates put CO₂e the emissions attributable to LNG at 19% to 23% higher than non-liquefied gas.²²² Of course, as explained above, production and distribution of natural gas entails greenhouse emissions even when gas is consumed domestically. Using what are now out-of-date estimates of traditional gas's lifecycle emissions, Jaramillo concluded LNG's lifecycle greenhouse gas emissions can bring LNG into parity with coal:

²²¹ 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"), available at http://www.ce.cmu.edu/~gdrg/readings/2007/09/13/Jaramillo_ComparativeLCACoalNG.pdf, attached as Exhibit 89. The cited estimate for the greenhouse gas emissions of liquefaction, transport, and regasification are derived by adding figures for these phases recorded in Figure 6S, p. 9 the supporting information for this article, which is available at http://pubs.acs.org/doi/suppl/10.1021/es063031o/suppl_file/es063031osi20070516_042542.pdf, and is attached as Exhibit 90 ("Jaramillo 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 91. A more recent study reached a similar conclusion, suggesting that U.S. LNG may be about 15% more carbon-intensive than ordinary gas. Testimony of James Bradbury, World Resources Institute, Before the U.S. House of Representatives, Energy and Commerce Subcommittee on Energy and Power (May 7, 2013) at 15 (drawing on data from recent life cycle assessments), attached as Exhibit 92, available at <http://docs.house.gov/meetings/IF/IF03/20130507/100793/HHRG-113-IF03-Wstate-BradburyJ-20130507.pdf>

²²² See, e.g., Jaramillo Supporting Info, *supra* n.221, at 9.

Figure 2: Life-Cycle Emissions of LNG, Natural Gas, and Coal in Electricity Generation²²³



Jaramillo’s analysis may understate LNG’s lifecycle greenhouse gas emissions, because this analysis does not reflect recent studies that have raised estimates for emissions associated with natural gas production. Jaramillo used pre-shale-gas-boom estimates of gas’s non-combustion, non-LNG-specific lifecycle emissions as falling between 15.3 to 20.1 pounds CO₂e/ MMBtu.²²⁴ Studies conducted since the shale gas boom estimate that aggregate domestic natural gas production (including conventional and unconventional production) releases at least 44 pounds of CO₂e per MMBtu, at least 24 pounds higher than Jaramillo’s estimates. A report from the Worldwatch Institute and Deutsche Bank summarizes much of the recent work.²²⁵ 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,²²⁶ Mohan Jiang et al. of Carnegie-Mellon,²²⁷ and Timothy Skone of NETL.²²⁸ The Worldwatch Report separately derived a “top-down” estimate, which produced a result similar to the NETL estimate.²²⁹ These various assessments are summarized in the following chart.

²²³ From Jaramillo 2007, *supra* n.221, at 6,295. “SNG,” in the figure, refers to synthetic natural gas made from coal.

²²⁴ Jaramillo Supporting Information, *supra* n.221, at 8.

²²⁵ Mark Fulton et al., *Comparing Life-Cycle Greenhouse Gas Emissions from Natural Gas and Coal* (Aug. 25, 2011) (“Worldwatch Report”), attached as Exhibit 93.

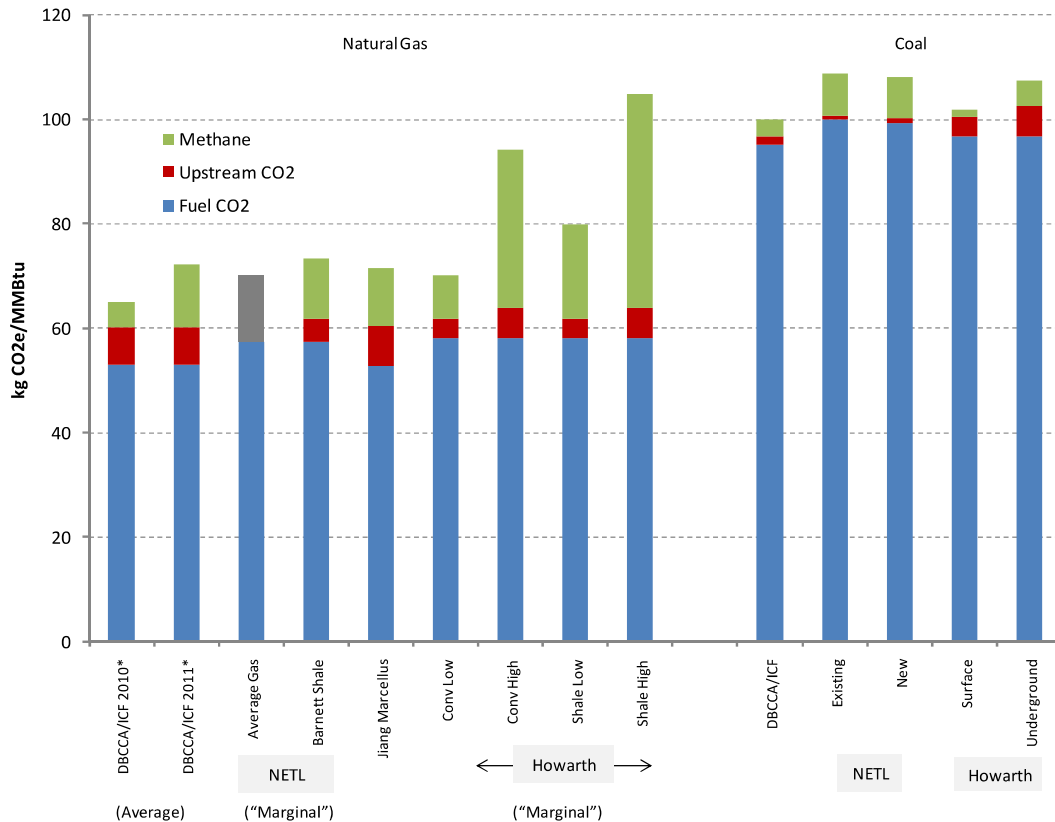
²²⁶ Robert W. Howarth et al., *Methane and the greenhouse-gas footprint of natural gas from shale formations*, *Climatic Change* (Mar. 2011), attached as Exhibit 94.

²²⁷ Mohan Jiang et al., *Life cycle greenhouse gas emissions of Marcellus shale gas*, *Environ. Res. Letters* 6 (Aug. 2011), attached as Exhibit 95.

²²⁸ 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 96. NETL has also published 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 97.

²²⁹ Worldwatch Report, *supra* n.225, at 9.

Figure 3: Comparison of Recent Life-Cycle Assessments²³⁰



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, most of them estimate production greenhouse gas emissions (combined methane and “upstream CO₂”) in a similar range. Synthesizing these studies, the Worldwatch Report estimated normalized life-cycle GHG emissions from domestic natural gas production (*i.e.*, excluding liquefaction, transport, and gasification of LNG) at approximately 20.1 kilograms, or over 44 pounds, of CO₂e/MMBtu,²³¹ beyond the 120 pounds of CO₂e/MMBtu emitted by gas combustion. Moreover, as the above figure shows, some studies estimate that production emissions are significantly higher. Two studies completed after the Worldwatch report provide further evidence that unconventional gas production has high lifecycle emissions: one in line with the Worldwatch synthesis, finding that production adds approximately 23kg of CO₂e/MMBtu;²³² and another finding drastically higher emissions.²³³ Updating Jaramillo’s calculations to use these more recent lifecycle emissions estimates further erodes what little climate advantage Jaramillo found LNG to

²³⁰ *Id.* at 3.

²³¹ *Id.* at 15 Ex. 8.

²³² JISEA Report, *supra* n.219 (also expressing this figure as 78g CO₂e/kWh).

²³³ J. Tollefson, *Methane leaks erode green credentials of natural gas*, *supra* n.90.

have over coal. Jaramillo estimated total life-cycle emissions for LNG at 149.6 to 192.3 lbs CO₂e/MMBtu.²³⁴ Simply increasing these life-cycle estimates by 24 lbs CO₂e represents an additional 12% to 16% increase in total emissions.

To predict the effects of LNG exports, Worldwatch and Jaramillo's numbers must be increased even further because they consider the average of current U.S. production, but production induced by exports (like future increases in production generally) will include a higher proportion of unconventional gas than the current production mix, and these unconventional sources are likely to have higher greenhouse gas emissions. As noted above, the EIA Export Study predicts that extraction induced by exports will overwhelmingly be from shale gas sources.²³⁵ Several studies have found that shale gas has higher production emissions than conventional sources. Notably, EPA recently estimated methane emissions from a conventional well completion at only 0.80 tons, while completion of a hydraulically fractured well yielded 158.55 tons of methane.²³⁶ The possibility that unconventional production induced by exports could release substantial quantities of greenhouse gases highlights the need for a thorough study regarding the indirect and cumulative impacts of export prior to any DOE/FE authorization.²³⁷ Further study is similarly needed to combine the analysis of export on fuel switching domestically with life-cycle emissions of LNG exports. In light of the evidence presented above, it is unlikely that LNG export will reduce global greenhouse gas emissions.

Third and finally, we note that a course of action that leads other countries to build additional gas infrastructure to use imported LNG, which would likely entrench gas use for decades to come, is not the sort of action necessary to avoid serious climate impacts. Even if, contrary to IEA's predictions, imported LNG displaces other fossil fuels, the resulting emission reductions will be much less than those needed to stabilize

²³⁴ *Id.*

²³⁵ EIA Export Study, *supra* n.3, at 11.

²³⁶ See 2011 TSD, *supra* n.87 at 4-7 (Table 4-2).

²³⁷ Although JISEA recently found greenhouse gas emissions from unconventional production in the Barnett shale to be "similar to levels reported in the literature from conventional natural gas," JISEA, *supra* n.232, at 4, that study's estimates may be too low. First, the JISEA study used data from the Barnett Shale, which is located in an ozone nonattainment area where emissions are likely to be rigorously controlled. It is therefore possible that its results may not generalize well to production in other plays. Second, the study did not include emissions associated with liquids unloading, a practice that involves removal of liquids from the well and consequent release of greenhouse gases, based on the assumption that liquids unloading is not frequently practiced in unconventional production. A recent industry survey suggests that liquids unloading is in fact practiced in unconventional production, however, so it may be appropriate to add emissions from liquids unloading to JISEA's life-cycle emissions total. Adding emissions associated with liquids unloading would contribute an additional 6 to 28 grams of CO₂e/kWh, or even 100g under low-recovery conditions. JISEA, *supra* n.232, at 29 (citing Terri Shires & Miriam Lev-On, Characterizing Pivotal Sources of Methane Emissions from Unconventional Natural Gas Production 11-14 (2012), attached as Exhibit 98).

atmospheric greenhouse gases below a catastrophic level.²³⁸ DOE/FE must investigate policy options that would encourage the emissions reductions necessary to avert climate disaster, such as installation of infrastructure for renewables rather than fossil fuels. Merely slowing the rate of greenhouse gas emission growth, rather than causing emission reduction, will not avert the crisis.

4. Economic Impacts

a. Price Increases

Natural gas exports will increase domestic gas prices. There is a broad consensus on this issue, which Trunkline does not dispute. Trunkline further acknowledges that, as we explain above, DOE/FE must consider the cumulative impacts of the pending export proposals.²³⁹

Trunkline provides only a fleeting discussion of price impacts, instead focusing on natural gas supplies. As we explain in part III.A.1 above, Trunkline's assertion that adequacy of supply is the be-all and end-all of the NGA public interest inquiry is contradicted by appellate caselaw and DOE/FE policy. Nonetheless, we note that Trunkline's own argument demonstrates that exports can drastically impact domestic gas supplies. Although Trunkline predicts that its "high export case" would, over the 20 year period for which export authorizations are typically requested, result in the export of a third of all remaining gas in the US (721 tcf of gas, out of the 2,203 tcf of technically recoverable reserves estimated by EIA in 2012). App. at 14. As explained above, Trunkline's purported "high export case" considers less than half of exports already proposed. Thus, it is clear that exports have the potential to drastically affect total US gas supply.

Thus, it is no surprise that exports would also significantly affect US prices. EIA predicts that in its reference case, 6 bcf/d of exports increase Henry Hub gas prices by 10 to 13%, or 52 to 66 cents per MMBtu, relative to a baseline in which no North American exports occur.²⁴⁰ Trunkline asserts that such exports would cause only a 12 cent price increase, citing a Deloitte study not submitted with Trunkline's application. App. at 16. For the 12 bcf/d scenarios, EIA's reference case predicts 14 to 26% increases in Henry Hub prices; Trunkline offers no equivalent prediction.²⁴¹ On the available record, it

²³⁸ Tom Wigley, *Coal to gas: the influence of methane leakage*, 108 *Climatic Change* 601, 602 (2011), Exhibit 99 <http://www.usclimatenetwork.org/resource-database/report-coal-to-gas-the-influence-of-methane-leakage>; Myhrvold & Caldeira, *Greenhouse gases, climate change and the transition from coal to low-carbon electricity*, 7 *Environmental Research Letters* (2012); Exhibit 100 http://iopscience.iop.org/1748-9326/7/1/014019/pdf/1748-9326_7_1_014019.pdf

²³⁹ Sierra Club contends that even if Trunkline's proposal is considered in isolation, the proposed exports will have significant and adverse price impacts.

²⁴⁰ EIA Export Study, *supra* n.3, at table B1.

²⁴¹ *Id.*

would be arbitrary and capricious for DOE/FE to adopt the estimates fleetingly cited by Trunkline instead of EIA's well-supported forecast. DOE/FE cannot supplant the open and transparent analysis of its impartial sister agency with this "black box" assertion provided by the applicant itself.

Of course, even the EIA scenarios are too low. Pending nFTA applications seek authorization to export 28.54 bcf/d of gas to non-free trade agreement nations,²⁴² amounting to over 34% of current domestic gas production.²⁴³ EIA's model only considers scenarios in which export creates 6 or 12 bcf/d of additional demand.²⁴⁴ Accordingly, before DOE/FE can meaningfully evaluate the cumulative impacts of Trunkline's and other export proposals, DOE/FE must work with EIA to develop forecasts of the price impacts of higher export volumes.

b. Trunkline's Project Will Harm U.S. Workers and the U.S. Economy

Trunkline argues that its project will further the public interest by creating jobs and boosting the U.S. economy, App. at 16-18, but these benefits are both overstated and dwarfed by the economic harms increased gas prices will entail. The project will likely cause net economic harm even if environmental impacts are excluded from consideration. When environmental impacts (and their economic effects) are considered in addition to these purely economic harms, as they must be, it is clear that the project is contrary to the public interest.

Trunkline does not acknowledge, much less discuss, the economic harms exports will cause. Domestic gas price increases that will result from exports will have far-reaching effects on the U.S. economy. Consumers will face higher total gas bills despite reducing their consumption of gas. Employment and wages in energy-intensive industries such as manufacturing will decline because of reduced gas prices. Even in regions where export spurs additional gas production, temporary growth in jobs will likely lead to long-term economic decline, as these regions suffer from the "resource curse" and boom-bust cycle that plagues extractive economies. The result will be decreases in real wage growth for the overwhelming majority of Americans who do not own (directly or indirectly) stock in gas producing companies, as well as decreases in nationwide

²⁴² Applications Received by DOE/FE to Export Domestically Produced LNG from the Lower-48 States, *supra* n.18.

²⁴³ Specifically, it is over 34% of domestic production for the highest month in the past year, November 2012, when monthly production was 83.54 bcf/d. EIA, Monthly Natural Gas Gross Production Report (January 31, 2013), attached as Exhibit 101. Over the entire year, average monthly production is lower, and thus the percentage is greater.

²⁴⁴ *EIA Export Study*, *supra* n.3, at 1. Note that the EIA price scenarios look at the demand created by exports (i.e., the gas exported as well as the gas used in operating liquefaction equipment, typically an extra 10% of the exported volume), whereas the DOE/FE figure for total volume of proposed exports provided above only considers the gas actually exported. Thus, potential demand resulting from exports could be 10% higher than the 28.54 bcf/d figure DOE/FE provides.

employment.²⁴⁵ As with environmental effects, DOE/FE cannot approve the pending application without thoroughly considering these impacts. If DOE/FE were to make a decision on the available evidence, DOE/FE would have to conclude that these impacts render exports contrary to the public interest.

Perhaps the most immediate and dramatic economic effect of exports will be job losses in energy intensive industries, such as manufacturing. Although the NERA Study was not designed to capture this effect, NERA predicts declines in wage income for each of its export scenarios, and changes in wage growth can be translated into losses of job equivalents (as NERA has done using the same model elsewhere). According to NERA, exports will cause these industries to suffer job losses in the tens to hundreds of thousands.²⁴⁶ This is true even if Trunkline's exports are considered in isolation. Trunkline's project would require 2.2 bcf/d of gas, 0.803 trillion cubic feet per year (tcf/y). Many of NERA's scenarios considered export-created demand of only 0.37 tcf/y by 2015.²⁴⁷ NERA predicts that even this minimal level of export would cause a net decrease in wage income equivalent to between 15,000 and 31,000 jobs during the same timeframe.²⁴⁸ Notably, NERA's forecast concerns changes in *net* wage income, and therefore attempts to include the offsetting effects of job creation in gas production, terminal construction, and other industries. For reasons we detail in our comments on the NERA Study, the actual consequences are likely to be even worse. Moreover, as we explain in part III.B above, DOE/FE cannot consider Trunkline's proposal in isolation. Research on the effects of LNG export in Australia, which has already accumulated experience with gas exports, demonstrates the adverse effects exports can have on domestic industry.²⁴⁹

Even in the regions and communities that experience short-term job growth as a result of increases in gas production, over the long term, the "resource curse" that affects extractive economies will likely leave these communities worse off. "Resource curse" effects are well documented in the economic literature. One of the most comprehensive surveys, by Professors Freudenburg and Wilson, of economic studies of "mining" communities (including oil and gas communities) concludes that the long-term economic outcomes are "consistently and significantly negative."²⁵⁰ Headwaters Economics performed a similar study in 2009, documenting this trend in western U.S

²⁴⁵ EIA Export Study, *supra* n.3, at 6, 14; NERA Study, *supra* n.3, at 8-9.

²⁴⁶ Sierra Club Initial NERA Comments, *supra* n.3, at 8, Ex. 5 (Synapse Report) at 5.

²⁴⁷ NERA Study, *supra* n.3, at 38.

²⁴⁸ Synapse Report at 5.

²⁴⁹ National Institute of Economic and Industry Research, "Large scale export of East Coast Australia natural gas: Unintended consequences." A report to the Australian Industry Group and the Plastics and Chemicals Industries Association, October 2012, attached as Exhibit 102 (full document), Exhibit 103 (summary).

²⁵⁰ W.R. Freudenburg & L.J. Wilson, *Mining the Data: Analyzing the Economic Implications of Mining for Nonmetropolitan Regions*, 72 *Sociological Inquiry* 549 (2002) at 549, attached as Exhibit 104.

counties which focused on resource extraction rather than more durable economic growth strategies. The Headwaters study looked at the performance of “energy-focusing” regions compared to comparable counties over the decades since 1970.²⁵¹ It concludes that “counties that have focused on energy development are underperforming economically compared to peer counties that have little or no energy development.”²⁵² A third study, by Amanda Weinstein and Professor Mark Partridge of Ohio State University, found this general trend to apply specifically to communities where shale gas extraction is occurring.²⁵³ Using Bureau of Economic Analysis statistics, the Ohio study directly compared employment and income in counties in Pennsylvania with significant Marcellus drilling and without significant drilling, and before after the boom started.

Communities where resource extraction occurs will suffer further harms not captured by these examinations of job statistics. Raw numbers of jobs or job-equivalents failure to capture the continuity or quality of jobs, but as we explain elsewhere, the gas production jobs that exports will create are typically short-term jobs, whereas the manufacturing and energy-intensive industry jobs it will eliminate are typically stable and long-term.²⁵⁴

DOE/FE gave short shrift to these concerns in the Freeport Conditional Authorization. Although DOE/FE acknowledged that regional impacts should be considered in DOE/FE’s review of individual LNG export applications, Order 3282 at 77, DOE/FE dismissed the evidence of a resource curse that Sierra Club and other commenters had provided, including the three studies cited above, with the superficial statement that “DOE/FE . . . finds that authorizing the Liquefaction Project is likely to have positive local and regional impacts. As explained above, the comments submitted in response to the LNG Export Study do not support a different conclusion,” *id.* at 78. Despite DOE/FE’s use of “as explained above,” DOE/FE provided no examination of this evidence or reason for disagreeing with it. Thus, DOE/FE’s rejection of this argument was arbitrary and capricious, and as it would be for DOE/FE to similarly disregard the resource-curse effect here.

These adverse effects on rate payers, employees in energy intensive industries, and communities where production occurs mean that exports will have grave distributional effects, as they harm wage-earning households and reduce employment while providing

²⁵¹ Headwaters Economics, *Fossil Fuel Extraction as a County Economic Development Strategy: Are Energy-Focusing Counties Benefiting?* (revised. July 2009), attached as Exhibit 105.

²⁵² *Id.* at 2.

²⁵³ 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”), attached as Exhibit 106.

²⁵⁴ Sierra Club Initial NERA Comment at 20-21.

benefit to the relatively few shareholders in gas industries.²⁵⁵ The NERA study attempts to downplay this fact by arguing that benefits realized by gas production companies are realized by “consumers” generally, because “[c]onsumers own all production processes and industries by virtue of owning stock in them.”²⁵⁶ As Sierra Club explained, however, only about half of American families own any stock at all, and only a small subset of stock owners own stocks in the gas production companies that will benefit from exports.²⁵⁷ Moreover, the NERA study wrongly assumes that gas production and liquefaction service companies are American owned, but as Sierra Club explained in its comments on the NERA study, this assumption is incorrect. Thus, in describing who will economically benefit from exports, NERA overstates both the extent to which benefits will accrue to most Americans and the extent to which benefits will accrue to Americans at all. In the Freeport Conditional Authorization, DOE/FE refused to examine this issue, assuming that foreign investment in gas production would cause a dollar-for-dollar displacement of domestic investment in other industries. Order 3282 at 93. DOE/FE did not identify any evidence of this, nor any analysis of its implications. Of course, as the NERA study indicates, exports will have winners and losers. It may be that, because foreign investors already own shares of gas companies, this has freed up American investment money for other industries, but the NERA study provides no indication that those other industries will receive the same benefits the foreign owners of gas companies will receive as a result of exports. For all these reasons, most Americans will not share in the benefits of LNG exports.

Because LNG exports will cause all Americans to pay higher energy rates, they will cause many Americans to lose their jobs, and they will benefit only a few Americans, who are generally already wealthy, who own shares of companies in a few industries, it is clear that most Americans will be worse off with LNG exports than they would be without them. DOE/FE’s Freeport Conditional Authorization refused to acknowledge this evidence, concluding that this evidence was not “sufficiently compelling” to demonstrate that the harmful distributional effects of exports outweigh the minimal GDP growth forecast by NERA. Order 3282 at 75. DOE/FE’s only explanation as to the purported deficiency in this evidence was that “None of the commenters [making distributional arguments] has performed a quantitative analysis of the distributional consequences of authorizing LNG exports at the household level.” *Id.* In light of the aggregate job data, ratepayer effects, and shareholder data provided by the Sierra Club, there is no apparent reason why a household-level study is necessary.

The Obama Administration has repeatedly emphasized the need to avoid regressive policies that transfer wealth from the middle classes to the wealthy.²⁵⁸ The President

²⁵⁵ See, e.g., Sierra Club Initial NERA Comments, *supra* n.3, at 10.

²⁵⁶ NERA Study, *supra* n.3 at 55 n.22.

²⁵⁷ Sierra Club Initial NERA Comment, *supra* n.3, Ex. 5, 9-10.

²⁵⁸ See, e.g., State of the Union Address (January 24, 2012), attached as Exhibit 107, available at <http://www.whitehouse.gov/the-press-office/2012/01/24/remarks-president-state-union-address>

recently explained that “Our economic success has never come from the top down; it comes from the middle out. It comes from the bottom up.”²⁵⁹ Similarly, the President has warned against short-sighted management of wealth. As he explained in the 2009 State of the Union address, the nation erred when “too often short-term gains were prized over long-term prosperity, where we failed to look beyond the next payment, the next quarter, or the next election.”²⁶⁰ DOE/FE must not allow a “surplus [to] bec[o]me an excuse to transfer wealth to the wealthy instead of an opportunity to invest in our future.”²⁶¹

Before granting Trunkline’s or any other would-be exporter’s application, DOE/FE must analyze exports’ implications for the economy not just on a macroeconomic scale, but also at local and regional levels; it must consider the effects of increasing U.S. dependence on resource exports on gasfield communities, domestic industry, and the environment; and it must consider counterfactuals, allowing it to evaluate whether the national would be better off without LNG export, or with lower export volumes.²⁶²

In summary, the NGA’s “public interest” test requires DOE/FE to determine whether the country would be better off with Trunkline’s proposal than without it. Information in the record demonstrates that exports will transfer wealth from the many to the few.

c. GDP Impacts

The NERA Study’s broad conclusion that the US would be better off with exports, or that the net effect of exports is positive, rests almost entirely on a forecast of net GDP growth as a result of exports. DOE/FE rested on this conclusion in refusing to consider distributional effects in the Freeport Conditional Authorization. Order 3282 at 75. Even on this narrow issue, however, the NERA Study’s conclusion is contradicted by other available studies, such as the comprehensive model of LNG exports’ impacts conducted recently by Purdue University economists Kemal Sarica and Wallace E. Tyner.²⁶³ The Tyner study found that exports would cause a net reduction in GDP, and acknowledged that its methodology, like NERA’s, excluded numerous other factors that would further drive down GDP.

²⁵⁹ Remarks by the President at the Daimler Detroit Diesel Plant, Redford, MI (Dec. 10, 2012), attached as Exhibit 108 and available at <http://www.whitehouse.gov/the-press-office/2012/12/10/remarks-president-daimler-detroit-diesel-plant-redford-mi>

²⁶⁰ State of the Union Address (Feb. 24, 2009), attached as Exhibit 109, available at http://www.whitehouse.gov/the_press_office/Remarks-of-President-Barack-Obama-Address-to-Joint-Session-of-Congress

²⁶¹ *Id.*

²⁶² See Sierra Club Initial NERA Comments; see also Sierra Club Reply NERA Comment.

²⁶³ See Kemal Sarica & Wallace E. Tyner, *Economic and Environmental Impacts of Increased US Exports of Natural Gas* (Purdue Univ., Working Paper, 2013) (available from the authors) [hereinafter Purdue Study].

Among these excluded factors are the environmental impacts of gas production, and of the failure to regulate it. These impacts must be factored into assessment of exports' net and distributional impacts. In terms of net impacts, the economic cost of environmental harm, such as the cost of increased air emissions, erodes (if not entirely erases) the net benefit NERA purports to find. Although DOE/FE cannot limit its consideration of environmental impacts to those that are easily monetizable, DOE/FE must, at a minimum, apply available tools to estimate the economic impacts of environmental harms. For example, under the USREF_SD_LR scenario, NERA predicts 2.19 tcf/y of exports in 2035, with a \$2 billion GDP increase relative to the baseline.²⁶⁴ Using EIA estimates of the share of exports that will result from induced production (63%) and a modest estimate of the leak rate for gas production (2.4%), the Sierra Club estimated that 2.19 tcf/y of exports will release an additional 689,000 tons of methane into the atmosphere each year.²⁶⁵ Using a conservative global warming potential for methane of 25 and EPA's social cost of carbon price of \$25/ton, the social cost of the production-side methane emissions alone will be \$430,625,000,²⁶⁶ displacing more than 20% of the GDP increase NERA predicts under this scenario. Liquefaction and processing of natural gas further adds to greenhouse gas emissions. Other environmental impacts also impose monetizable costs, which must be added to any calculation of net impacts and thus further erase the claimed benefit.

Thus, there is significant doubt as to whether, when all things are considered, the net effect of export would be positive. Thus, even putting aside the serious distributional concerns identified in the previous section, and the the environmental and other effects that can be difficult to monetize, exports may cause a net decrease in GDP. DOE/FE therefore cannot use the NERA Study's prediction of an increase in GDP as evidence that exports will in fact be consistent with the public interest.

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

The NGA, 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 1110-11. 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*

²⁶⁴ Compare NERA Study, *supra* n.3, at 179 with Sierra Club Initial NERA Comment, *supra* n.3, at 186.

²⁶⁵ See Sierra Club Initial NERA Comment, *supra* n.3, at 31-32, for methodology.

²⁶⁶ *I.e.*, (25)(25)(\$689,000). For more background on these estimates, see Sierra Club Initial NERA Comment, *supra* n.3, at 33-34.

Farm Mut. Auto. Ins. Co., 463 U.S. 29, 43 (1983) (emphasis supplied). DOE/FE cannot rationally find for Trunkline on the record in this case.

As we have demonstrated, record support for Trunkline's claimed benefits is extraordinarily thin. Trunkline has submitted economic benefit information derived from input-output modeling, but the underlying model does not show whether the economy would be better off without Trunkline's proposal than it would without it.

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 consumers. These costs will propagate through the economy, retarding growth. We have 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, we have shown that gas extraction and export have major environmental (and, hence, additional economic) costs, which Trunkline 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).

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

If DOE/FE nonetheless approves Trunkline'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.²⁶⁷

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 Trunkline nor DOE/FE have described or proposed such terms, Sierra Club 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 Trunkline's export proposal for the reasons described above. Trunkline's application is not consistent with the public interest and must be denied.

Respectfully submitted,



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²⁶⁷ Providing a clear monitoring plan of this sort will also benefit Trunkline, 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. 13-04-LNG
Trunkline LNG Export, 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 20th day of May, 2013.



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UNITED STATES OF AMERICA
DEPARTMENT OF ENERGY
OFFICE OF FOSSIL ENERGY

IN THE MATTER OF)
) FE DOCKET NO. 13-04-LNG
Trunkline LNG Export, 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 May 20, 2013.

Dated at San Francisco, CA, this 20th day of May, 2013.



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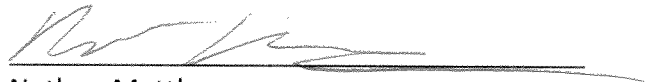
UNITED STATES OF AMERICA
DEPARTMENT OF ENERGY
OFFICE OF FOSSIL ENERGY

IN THE MATTER OF)
) FE DOCKET NO. 13-04-LNG
Trunkline LNG Export, LLC)
)

VERIFICATION

SAN FRANCISCO §
 §
CALIFORNIA §

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.



Nathan Matthews
Associate Attorney
Sierra Club Environmental Law Program
85 Second Street, Second Floor
San Francisco, CA 94105
Telephone: (415) 977-5695
Fax: (415) 977-5793
Email: nathan.matthews@sierraclub.org

Subscribed and sworn to before me this 20th day of May, 2013.

See attached "Sunat Certificate"
Notary Public

My commission expires: _____

CALIFORNIA JURAT WITH AFFIANT STATEMENT

GOVERNMENT CODE § 8202

- See Attached Document (Notary to cross out lines 1-6 below)
- See Statement Below (Lines 1-6 to be completed only by document signer[s], *not* Notary)

 Signature of Document Signer No. 1

 Signature of Document Signer No. 2 (if any)

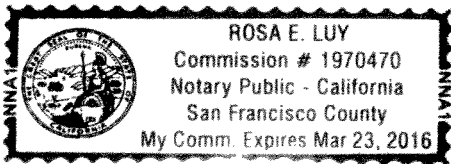
State of California

County of San Francisco

Subscribed and sworn to (or affirmed) before me

on this 20th day of May, 2013
Date Month Year

by
 (1) NATHAN MATTHEWS
Name of Signer



proved to me on the basis of satisfactory evidence to be the person who appeared before me (.)

(and

(2) _____
Name of Signer

proved to me on the basis of satisfactory evidence to be the person who appeared before me.)

Signature _____
Signature of Notary Public

Place Notary Seal Above

OPTIONAL

Though the information below is not required by law, it may prove valuable to persons relying on the document and could prevent fraudulent removal and reattachment of this form to another document.

Further Description of Any Attached Document

Title or Type of Document: Verification

Document Date: 5/20/2013 Number of Pages: 1

Signer(s) Other Than Named Above: _____

RIGHT THUMBPRINT OF SIGNER #1
 Top of thumb here

RIGHT THUMBPRINT OF SIGNER #2
 Top of thumb here