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UNITED STATES OF AMERICA
DEPARTMENT OF ENERGY
OFFICE OF FOSSIL ENERGY

IN THE MATTER OF	)	
	)	**FE DOCKET NO. 12-156-LNG**
Golden Pass Products LLC	)	
	)	

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

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Introduction

Golden Pass Products LLC ("Golden Pass")'s application for authorization to export 740 bcf per year (approximately 2.4 bcf/d) of natural gas as LNG cannot move forward without extensive environmental and economic analysis that has not been provided to the Department of Energy Office of Fossil Energy (DOE/FE). The available evidence demonstrates that this proposal is inconsistent with the public interest.

Golden Pass's application materials primarily assert economic benefits from the construction and operation of the proposed export facility, which would be built at Golden Pass's existing import operation, and from the additional gas production necessary to supply the facility. *See* App. at iii. But available evidence, including a study DOE/FE has commissioned and placed in this docket, demonstrates that these benefits are likely either more limited than Golden Pass contends, or entirely illusory because they come at the cost of harming the rest of the domestic economy.

Moreover, Golden Pass does not acknowledge the significant environmental (and, hence, economic) harm that its operations would cause, chiefly by increasing the production and burning of unconventional natural gas, at serious costs to water and air quality, and to climate stability.

DOE/FE cannot authorize exports without fairly weighing these significant environmental and economic impacts. *See Udall v. Federal Power Comm'n*, 387 U.S. 428, 450 (1967). Because Golden Pass has not even acknowledged these impacts, DOE/FE certainly may not approve its application on this record. On the contrary, available evidence cuts strongly against Golden Pass.

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 Golden Pass's application.

I. Sierra Club Should be Granted Intervention

Sierra Club members live and work throughout the area that will be affected by Golden Pass'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 GOLDEN PASS's. As of January 2013, Sierra Club had 22,089 members in Texas and 601,141 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 Golden Pass 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 Golden Pass 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 Golden Pass'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.

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.

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

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. The public interest inquiry is necessarily a broad one, as DOE/FE has recently affirmed in correspondence to Senator Ron Wyden, chair of the Senate Energy and Natural Resources Committee,[3] embracing a careful look at economic impacts and environmental considerations. Golden Pass has not provided sufficient information to justify its project on either of these fronts, and available evidence (including a study commissioned by DOE/FE itself) demonstrates that Golden Pass's proposal does not serve the public interest. For these reasons 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.

1. Natural Gas Act

[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).

[3] Letter from Daniel Poneman, DOE/FE to Senator Ron Wyden (Dec. 11, 2012), attached as Exhibit 2.

Pursuant to the Natural Gas Act and subsequent delegation orders, DOE/FE must determine whether Golden Pass'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 (such applications are often referred to as "nFTA" applications).[4] Courts, DOE/FE, the Federal Energy Regulatory Commission (FERC), and Golden Pass all agree that the "public interest" at issue in this provision includes a broad look at the economic implications of export as well as consideration of environmental impacts.

Section 3 of the Act provides:

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

15 U.S.C. § 717b(a).[5]

Courts interpreting this provision have held that the "public interest" encompasses the environment. The Natural Gas Act grants DOE/FE "authority to consider conservation, environmental, and antitrust questions," and failure to consider those matters would violate its obligations under the Act. *See 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 determination "can be made only after an exploration of all issues relevant to the 'public interest,' including future power demand and supply,

[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). DOE/FE has previously authorized Golden Pass to export approximately 1.5 bcf/d LNG to such nations. DOE/FE Order No. 3104 (June 15, 2012).

[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 Redelegation Order No. 00-002.04E (Apr. 29, 2011). The Federal Energy Regulatory Commission has separately been delegated authority regarding the permitting, siting, construction and operation of export facilities. Department of Energy Delegation Order No. 00-004.00A. *See also* Executive Orders 12038 & 10485 (vesting any executive authority to allow construction of export facility in the Federal Power Commission and its successors).

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 has also acknowledged the breadth of the public interest inquiry and recognized that it encompasses environmental concerns. In its recent letter to Senator Wyden, DOE wrote that "environmental considerations" are included in the analysis.[7] Deputy Assistant Secretary Smith has likewise testified that "[a] wide range of criteria are considered as part of DOE's public interest review process, including . . . U.S. energy security . . . [i]mpact on the U.S. economy . . . [e]nvironmental considerations . . . [and] [o]ther issues raised by commenters and/or interveners deemed relevant to the proceeding."[8] DOE rules require export applicants to provide information documenting "[t]he potential environmental impact of the project." 10 C.F.R. § 590.202(b)(7). In a previous LNG export proceeding, DOE determined that the public interest inquiry looks to "domestic need" as well as "other considerations" that specifically included the environment.[9] FERC has agreed that environmental issues are included in the public interest calculus. 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).[10] Golden Pass itself acknowledges that the public interest determination includes consideration of environmental effects. App. at 40.

Golden Pass nonetheless still cites DOE/FE's nearly thirty-year-old *import* policy guidelines to contend that DOE/FE's consideration should focus entirely on market competition and price issues. App. at 13. Although such issues are certainly relevant (and cut against Golden Pass, on the whole), DOE/FE has been clear that its approach has "evolved" and is now substantially broader.[11] Necessarily so, because the policy

[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] Letter from Daniel Poneman, DOE/FE to Senator Ron Wyden at 2.

[8] The Department of Energy's Role in Liquefied Natural Gas Export Applications: Hearing Before the S. Comm. on Energy and Natural Resources, 112th Cong. 4 (2011) (testimony of Christopher Smith, Deputy Assistant Secretary of Oil and Gas), attached as Exhibit 3.

[9] *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).

[10] 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.

[11] Letter from Daniel Poneman, DOE/FE to Senator Ron Wyden at 2.

questions implicated by natural gas export are quite distinct from those relevant to the imports under consideration at the time of the guidelines. The primary issue confronted these guidelines was whether to directly regulate prices at which gas could be imported from Canada.[12] Now, DOE/FE is considering applications which would, cumulatively, export a substantial portion of U.S. gas supply and greatly expand gas production in this country. The guidelines can, thus, offer only limited guidance, at best. In fact, DOE has applied its "policy guidelines" regarding the public interest to focus review "on the domestic need for the natural gas proposed to be exported; whether the proposed exports pose a threat to the security of natural gas supplies, *and any other issue determined to be appropriate*." Opinion and Order Conditionally Granting Long-Term Authorization to Export [LNG] from Sabine Pass LNG Terminal to Non-Free Trade Agreement Nations ("*Sabine Pass*"), DOE/FE Order 2961 at 29 (May 20, 2011) (citing 49 Fed. Reg. 6,684 (Feb. 22, 1984)) (emphasis added).[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 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]

[12] 49 Fed. Reg. at 6,684-85.

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

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. As we explain in more detail below, a full EIS is required here.

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,

[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 meets its statutory responsibilities under section 3 of the NGA and under NEPA.").

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.[15]

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[15] Other statutes also attach important obligations, which neither Golden Pass nor DOE/FE have addressed.

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 GOLDEN PASS'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 Golden Pass 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 GOLDEN PASS's proposal. 16 U.S.C. § 1536(a), (b).

The National Historic Preservation Act (NHPA) imposes similar obligations with regard to historically and culturally sensitive properties. 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). 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

B. A Full Environmental Impact Statement, Rather than an Environmental Assessment, Is Required Here

DOE/FE now has 16 nFTA applications before it for the cumulative export of 24.8 bcf/d of natural gas (including 2.2 bcf/d it has already approved for export from the Sabine Pass facility).[16] It has also authorized 31.41 bcf/d of export to free-trade-agreement ("FTA") nations because it believes it lacks discretion to deny such FTA applications – though such FTA licenses are of somewhat less moment because most major gas importers are nFTA nations.[17]

These are very large volumes of gas. In 2011, the United States produced just under 23,000 bcf of gas over the year.[18] The 24.8 bcf/d of nFTA exports are equivalent to 9,052 bcf/y, or about 39% of total U.S. production in 2011. Exporting such a large volume would have major effects on the U.S. economy and the environment, as production both increases and shifts away from domestic uses. Yet Golden Pass's application fails to account for the significant negative consequences of these impacts.

Golden Pass's application is 15th in line for approval by DOE/FE. If DOE/FE approves all the applications before Golden Pass, it will have granted permission for 21.1 bcf/d of export already, not counting FTA exports, before Golden Pass's exports even appear for consideration. DOE/FE must consider Golden Pass's application against this backdrop of significant export, and already significant environmental and economic impacts

The proposed exports and terminal would have severe adverse environmental impacts, plainly surpassing the threshold of "significance" that mandates preparation of a full EIS. NEPA requires an EIS where a proposed major federal action would "significantly affect[]

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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 Golden Pass'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.

[16] DOE/FE, *Applications Received by DOE/FE to Export Domestically Produced LNG from the Lower 48 States* (January 11, 2013), available at: http://fossil.energy.gov/programs/gasregulation/reports/summary_lng_applications.pdf.

[17] The 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). This provision was intended to speed *imports* of natural gas from Canada. Congress never understood it to allow automatic licenses for export. *See generally*, C. Segall, *Look Before the LNG Leap*, Sierra Club White Paper (2012) at 40-41 (discussing the congressional history of this provision), attached as Exhibit 4. That DOE/FE has nonetheless issued export licenses under it, without raising the issue for Congressional correction, is itself an arbitrary and dangerous decision, inconsistent with Congressional intent.

[18] EIA, Natural Gas Monthly December 2012, Table 1 (volume reported is dry gas), attached as Exhibit 5.

the quality of the human environment." 42 U.S.C. § 4332(C). As we explain elsewhere, LNG exports will induce additional gas production that, every year, will potentially emit millions of tons of methane pollution, emit hundreds of thousands of tons of VOC and hazardous air pollutants, and require of hundreds of millions of tons of fresh water. DOE/FE regulations categorically state 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. For these reasons, it is clear that, at a minimum, there is a "substantial question" as to whether Golden Pass's proposed exports would have a significant impact on the environment, and an EIS is therefore required. *Klamath Siskiyou Wildlands Center v. Boody*, 468 F.3d 549, 561-62 (9th Cir. 2006)

1. DOE/FE Must Consider the Cumulative Effect of All Pending Export Proposals, and Should Do So Using a Programmatic EIS

Again, Golden Pass'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' interactions. We note that in three similar proceedings EPA has 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."),[19] 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."),[20] EPA, *Scoping Comments – The Oregon LNG Export Project and Washington Expansion Project*, FERC Dkts. PF12-18 and PF12-20, at 3 (Dec. 26, 2012).[21]

DOE/FE can best conduct this analysis in the context of a programmatic EIS that considers the impacts of *all* gas export proposals at once (whether prepared by FERC or DOE/FE). 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

[19] Attached as Exhibit 6.
[20] Attached as Exhibit 7.
[21] Attached as Exhibit 8.

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 should conduct an EIS that is adequate to inform this programmatic decision, rather than conducting piecemeal, application-by-application analysis.

2. The Alternatives Analysis Must Consider This Broader Context

Both NEPA and the NGA require DOE/FE to fully consider alternatives to Golden Pass'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 Golden Pass'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 Golden Pass'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.

C. Golden Pass's Economic Implications are Contrary to the Public Interest

The NEPA analysis is intended to inform DOE/FE's analysis, and the public, but the ultimate substantive decision before DOE/FE is, of course, driven by the Natural Gas Act's public interest standard. In the remainder of this protest, we discuss why the record does not allow DOE/FE to conclude that Golden Pass's proposal is in the public interest. We begin with a discussion of the proposal's economic implications before turning to the environmental considerations.[22]

[22] There is, of course, overlap between the two. Economic decisions have environmental consequences and environmental impacts (such as air pollution) impose real monetary costs and alter economic possibilities.

Golden Pass grounds the economic argument for its proposal on its supposed benefits to to the U.S. economy. *See* App. at 29-32. Although Golden Pass acknowledges that its proposed exports, in concert with others proposed to DOE/FE, would raise domestic gas and energy prices, App. at 23, it maintains that its other benefits would make up for these costs. The economic studies which DOE/FE has added to this docket strongly suggest otherwise – as, in fact, do Golden Pass's own studies.

In fact, LNG exports are likely to depress the rest of the national economy, reduce employment overall (or, at best, have almost no positive effect upon it), and deepen national and regional dependence on fossil fuel extraction strategies that have been shown to damage economic growth and diversity. Deepening these destructive trends is not in the national interest.

1. Evidence Already in the Docket Argues Strongly Against Golden Pass's Application

After approving 2.2 bcf/d of exports in its *Sabine Pass* orders, DOE/FE recognized that further expanding LNG exports had potentially significant economic implications that required more careful study, and commissioned the Energy Information Administration (EIA) and a private consultant, NERA Economic Consulting, to investigate. Those investigations, though flawed, are now completed, and DOE/FE has added them, and the comments upon them, to this docket. The upshot of these studies is that LNG export comes at a significant net cost to the U.S. economy.

The EIA study, initially, shows that as gas exports increase, so do domestic gas prices – often quite sharply.[23] Although the magnitude of price increases depends upon the magnitude and speed of export, EIA determined that large percentage prices increases were possible even at export volumes of 6-12 bcf/d – a fraction of the volume now before DOE/FE.

The NERA study, although deeply flawed, candidly admits that the economy-wide price increases caused by LNG exports translate into economic decline for all sectors that do not hold natural gas export capital, including "households with income solely from wages" – that is, the vast majority of Americans.[24] According to NERA, GDP and real income decline in response to export.[25] Although it is true that NERA nonetheless concludes that export is a net benefit to U.S. GDP, this is *only* because NERA expects the revenues to LNG exporters to be higher than the total losses suffered by the rest of the

[23] EIA, Effect of Increased Natural Gas Exports on Domestic Energy Markets, 1 (2012) ("EIA Export Study").
[24] NERA Economic Consulting, *Macroeconomic Impacts of LNG Exports from the United States* (2012) ("NERA Study") at 8.
[25] *Id.*

country.[26] In essence, LNG exports transfer wealth from U.S. manufacturing, the poor and middle class, and essentially all other sectors to LNG exporters and gas companies. Such a transfer will weaken the remainder of the economy and exacerbate income inequality and dependence on fossil fuels. It is emphatically not in the public interest.

Indeed, there is a real question as to whether the net GDP result of this transfer is positive (leaving aside the key point that net GDP is not the right way of thinking about a process that benefits a very small sector of the economy at the cost of the nation as a whole). Also in the NERA comment docket, now included in this docket, are the results of a separate study by Dr. Wallace Tyner, a respected economist at Purdue University.[27] Dr. Tyner employed a macroeconomic model to analyze LNG exports independently and concluded that the net GDP effect is likely negative once all accounts on other sectors are accounted for.[28] He emphasizes, however, that this general negative effect understates the economic implications of diverting U.S. gas for export, writing that the "more important question is should the nation accept the economic losses in many key economic sectors to provide wealth transfers to natural gas resource owners?"[29]

The answer is that the U.S. should not accept the consequences of this ill-advised wealth transfer. Sierra Club has prepared a detailed analysis of the NERA and EIA studies, and commissioned independent economists at Synapse Energy Economics to evaluate these implications in more detail. Because these analyses are already in the docket, we will not restate them at great length here, and instead attach them and incorporate them (along with the exhibits thereto, which are also in the docket), in full, into this protest.[30] Among the key points those studies make are that:

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[26] *See id.*

[27] *See* Dr. Wallace Tyner *et al.*, *Comparison of Analysis of Natural Gas Export Impacts from Studies Done by NERA Economic Consultants and Purdue University* (2012), available at http://www.fossil.energy.gov/programs/gasregulation/authorizations/export_study/30_Wallace_Tyner01_14_13.pdf, attached as Exhibit 9.

[28] *See id.* at 4.

[29] *Id.*

[30] *See* Sierra Club, *Comments on the NERA Study* (2013) ("Sierra Economic Comments"), available at http://www.fossil.energy.gov/programs/gasregulation/authorizations/export_study/Sierra_Club01_24_13.pdf, attached, with all exhibits to those comments, as Exhibit 10, and Synapse Energy Economics, *Will LNG Exports Benefit the United States Economy?* (2013) ("Synapse Report") attached as Exhibit 11. All exhibits cited in initial Sierra Club comments on the LNG Export Study are available online. Exhibits 1-20 available here: http://www.fossil.energy.gov/programs/gasregulation/authorizations/export_study/Exhibits_1-20.pdf; Exhibits 21-40 available here: http://www.fossil.energy.gov/programs/gasregulation/authorizations/export_study/Exhibits_21-40.pdf; Exhibits 41-60 available here: http://www.fossil.energy.gov/programs/gasregulation/authorizations/export_study/Exhibits_41-60.pdf; Exhibits 61-79 available here: http://www.fossil.energy.gov/programs/gasregulation/authorizations/export_study/Exhibits_61-79.pdf.

LNG Exports Cause Economic Declines In All Other Sectors and are Linked to Unemployment.[31] For the reasons explained above, the cost increases from LNG export are felt in the remainder of the economy in reduced income and increased energy costs. The result is that the larger economy declines. According to Synapse's analysis of NERA's study, GDP shrinks by almost $ 6 billion outside of the LNG and gas sector in many export scenarios.[32] Moreover, Synapse calculated the likely employment implications of these declines (using methods developed by NERA) and concluded that an average of 131,000 job-equivalents (essentially the average salary of one worker) would be lost annually under median export scenarios.[33]

LNG Exports Reduce Income and Wages to Most Americans.[34] As NERA concedes, and as Synapse demonstrates, LNG exports even at moderate levels (well below the cumulative exports now before DOE/FE) will reduce aggregate labor income by billions of dollars.[35] Although it is true that a small percentage of Americans may recoup some of these losses through investments in gas companies and LNG exporters, most will not: only half of all families own any stock in any company at all, and stock ownership is concentrated in the wealthiest 10% of Americans.[36] Moreover, because many LNG exporters, including Golden Pass, are at least partially foreign-owned (by Qatari interests in Golden Pass's case), it is not clear all their revenues will be taxed or translated into stock revenue.[37] The upshot is that LNG export is likely to reduce the economic prosperity of the vast majority of Americans.

Rosy Reports of LNG Economic Benefits Ignore Significant Costs. LNG export proponents, including Golden Pass, tout the benefits of increased natural gas production and the revenues LNG export will bring. They consistently neglect, however, to attach any economic calculations of the costs of these activities, even though these costs are very large. As Sierra Club discusses at some length below and in its earlier comments, the costs include significant economic disruptions and dislocations associated with resource booms, major infrastructure costs (such as replacing and rebuilding roads and water systems in gas fields), and major public health and environmental management costs associated with gas production and export.[38] Such costs, of course, include the significant economic harm that will come with deepening dependence and

[31] *See* Sierra Economic Comments at 8, Synapse Report at 2-3.
[32] Synapse Report at 3.
[33] *Id.* at 4-5.
[34] Sierra Economic Comments at 7-10, Synapse Report at 8-12.
[35] Synapse Report at 8-10.
[36] Synapse Report at 9-10.
[37] *Id.* at 11-13.
[38] *See* Synapse Report at 13, Sierra Economic Comments at 29-52.

combustion of fossil fuels like LNG at a time of catastrophic global climate change. These costs are readily in the billions of dollars per year.[39]

Dependence on Fossil Fuel Extraction and Export is Strongly Associated with Economic Decline. The "resource curse" is a well-understood consequence for economies (whether national or regional) dependent upon the export and extraction of raw materials and, especially, of fossil fuels.[40] In essence, the rising cost of the exported commodity depresses domestic industries which previously relied upon it, and the rapid expansion of extraction in booming areas prices out other industries and residents. The result, according to the empirical long-term studies on which these analyses rely, is that "resource extraction[is] not…an antidote to poverty but as something more like a cause or correlate."[41] These very effects have been observed in gas production areas. Golden Pass's proposal to increase U.S. export of fossil fuels, and to increase domestic gas production, will intensify these ills.

Golden Pass's proposal, in short, bids fair to do economic damage across the country, and is not in the public interest, as the economic analyses already in the docket demonstrate at length. As we next discuss, the materials which Golden Pass has submitted do not alter this analysis.

2. Golden Pass's Own Economic Reports Do Not Demonstrate That Its Proposal Is in the Public Interest

Golden Pass supports its proposal with two economic reports, one by Deloitte, focusing on gas price and supply implications, and one by the Perryman Group, focusing on employment implications from operation of the terminal. Neither report addresses the core structural issues Sierra Club describes above and in the attached economic reports, or demonstrates that LNG exports at Golden Pass are in the public interest. Golden Pass's claims about trade benefits are similarly immaterial.

The Deloitte Report

The Deloitte Report documents significant gas price increases from export, even at far lower export levels than may occur. Golden Pass describes these increases as "quite small" but this is misleading. Deloitte predicts average price increases over 20 years at the Henry Hub of 0.8% assuming *only* Golden Pass's exports move forward.[42] This scenario is not at all likely. As we have explained above, DOE/FE has already approved

[39] *See id.*
[40] *See* Sierra Economic Comments at 13-24. Synapse Report at 13-14.
[41] *Id.* at 15 (quoting W.R. Freudenburg & L.J. Wilson, *Mining the Data: Analyzing the Economic Implications of Mining for Nonmetropolitan Regions*, 72 Sociological Inquiry 549, 553 (2002))
[42] Deloitte Report at 4.

2.2 bcf/d of export from Sabine Pass, and over 30 bcf/d of export to FTA nations, and Golden Pass's exports will not be considered until at least 21.1 bcf/d of export to nFTA nations have been considered by DOE/FE. It is, thus, incumbent on DOE/FE to consider Golden Pass's likely economic effects against a backdrop of significant export.

Indeed, DOE/FE must do so. DOE/FE cannot authorize this proposed export project or any other export proposal on the assumption that 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. In these cases, price increases will be substantially higher than Deloitte predicts.

But suppose that not all exports go forward. Golden Pass points out that about a third of the *import* capacity proposed in the 2000s was constructed, as part of its argument that DOE/FE can disregard the implications of the full export volume before. App. at 39. [43] Assuming, for the sake of argument, that the same proportion roughly applied to the export applications, the 21.1 bcf/d of export that will go before Golden Pass would translate into about 7 bcf/d of built projects, not including Golden Pass. With Golden Pass, that would be 9 bcf/d of export. At that volume, Golden Pass's own report predicts a 5.9% average price increase at the Henry Hub, and a 3.6% increase at the average U.S. citygate.[44] Still other projects may go forward: At 12 bcf/d, this looks more like a 8.1% increase at the Henry Hub, and 4.9% citygate increase,[45] and the increase will creep higher still if more projects move forward. In short, the "1%" figure Golden Pass focuses upon significantly lowballs the likely price increases, even if not all projects are built.

Moreover, Deloitte's projections are twenty-year averages. The short-term increases may well be significantly higher. This is particularly so because Deloitte's price projections are based on its assumption that gas supply will seamlessly grow to meet demand.[46] This assumption is not at all obvious. If supply is interrupted – by technical problems, by environmental restrictions that slow growth, or simply by limited gas availability – gas prices will be higher.

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[43] Golden Pass's predictions as to the fate of its competitors are obviously self-serving, and should not be relied upon. Moreover, Golden Pass – which has just finished constructing an LNG *import* terminal, in 2011,at the height of the domestic shale gas boom, is clearly not a particularly accurate predictor of gas market trends.

[44] *Id.*

[45] *Id.*

[46] *Id.* at 10-11.

For this reason, it is troubling that Deloitte apparently relied on the Annual Energy Outlook ("AEO") for 2011 to calculate its supply figures – it is not entirely clear where these came from, but Deloitte used that report for its demand figures, and affirms that the "AEO 2012 full report was not available at the study start time."[47] EIA has recently drastically reduced its estimates of total gas supplies. EIA's 2011 Annual Energy Outlook assumed total technically recoverable domestic shale gas reserves of 827 tcf. The more recent 2012 Annual Energy Outlook cuts the estimates of shale gas reserves by over 40%, to 482 tcf.[48] Nothing in the record, however, permits DOE/FE to disregard this lower estimate, produced by the federal agency charged with developing expertise in these matters. And EIA's prior export study demonstrates that the price impacts of exports are highly dependent on gas recovery and, by extension, the size of the domestic gas supply. The *EIA Export Study* evaluated various export regimes in the contexts of four background scenarios: the EIA's now-superseded AEO 2011 reference case, cases where shale recoveries were 50% higher or lower than in the reference case, and a high economic growth reference case. *Id.* Price impacts are dramatically higher when gas recoveries are lower.[49]

These impacts are magnified when exports are considered in aggregate, especially because prices increase non-linearly with exports. That is, going from 4 to 6 bcf/d in exports impacts domestic prices more than going from 0 to 2 bcf/d.[50] One reason for this is that domestic gas consumers differ in their ability to reduce gas consumption.[51] 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, even small price increases will lead price-sensitive domestic consumers to reduce their consumption, freeing gas supplies for exports and limiting price impacts.[52]

The upshot is that the Deloitte Report may well low-ball price increases. At a minimum, DOE/FE may not rely on Deloitte's low export volume calculations, but must consider possible price increases if all exports go forward – and certainly all exports which it will consider before Golden Pass's application.

More broadly, the Deloitte Report does not help Golden Pass's case because whatever the price increases are, Deloitte does not demonstrate that they are justified by

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[47] *Id.* at 5.

[48] EIA, Annual Energy Outlook 2012, at 9, 13 (June 2012) (discussing this change), attached as Exhibit 12.

[49] EIA Export Study, *supra* n.48, at Fig. 4 and tables B3 and B4.

[50] 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 13.

[51] *Id.* at 7.

[52] Estimates of exports' price impacts differ in their assumption of price sensitivity of domestic consumers. The Robert Brooks study, which estimates low price-sensitivity, predicts significantly higher price increases than either Navigant or the EIA study. *Id.* at 5, 7.

corresponding public benefits. As we have already discussed, the profits from LNG export will be captured by exporters and gas companies, not by the public. The public, instead, experiences declining incomes and employment. Deloitte offers no evidence to the contrary. Its analysis does not consider price impacts on the larger economy in any rigorous way, acknowledging that Deloitte found this impact "difficult to quantify."[53] As such, Deloitte can offer no firm conclusions on Golden Pass's real effect on GDP or, more importantly, on the strength and diversity of the U.S. economic base, and the record evidence shows that this impact is negative.

Deloitte's only speculation on this point is a set of assertions that LNG exports will stimulate gas production and so increase availability of natural gas liquids, stimulating the petrochemical industry.[54] This ungrounded speculation as to one segment of the U.S. economy does not demonstrate that exports are in the public interest, and particularly not so because Dow Chemical and other large manufacturers – who should know -- have filed detailed economic comments in this docket asserting that LNG export will *not* benefit them, and will in fact depress their operations.[55] DOE/FE should weigh Dow's own analysis above Deloitte's musings.

One more fundamental flaw underlies all of Deloitte's analysis. Deloitte, in essence, asserts that gas price increases will not do *too much* damage, and that LNG export and associated gas production will raise revenues in some sectors. But Deloitte, and Golden Pass, never consider any counter-factuals, even though the core question DOE/FE is considered is whether authorizing the proposed exports, or refraining them, is in the public interest. That question requires consideration of the economic world in which the exports do not move forward and the natural gas Golden Pass would have exported either remains in the ground or is used (in some portion) by the American economy. As our comments, Dow's comments, and the Synapse report all show, the nation does better without LNG exports than it does with them. Deloitte's assertion that *some* benefits accrue from export does not show that export is a superior choice, and, hence, cannot show that export is in the public interest.[56]

The Perryman Report

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[53] Deloitte Report at 19.

[54] *Id.* at 20-21.

[55] *See* Comments of Dow Chemical (2013), available at http://www.fossil.energy.gov/programs/gasregulation/authorizations/export_study/peter_molinaro_em01_24_13.pdf, attached as Exhibit 14.

[56] We note that Deloitte includes a disclaimer in its report warning that its models are "not intended to be predictions of events or future outcomes" and warning that the report "should not be disclosed to, used or relied upon by any other person or entity" than Golden Pass – even though the report may be submitted to DOE. Deloitte Report at 2 n.2. It adds that Deloitte is not responsible for "any loss sustained by any such use or reliance." *Id.* If the Deloitte report is so unreliable that Deloitte feels it must warn against disclosure or reliance, and protect itself against any losses, it surely is not reliable enough to support DOE/FE's public interest process, which will determine national policy matters.

Golden Pass's second submission is an economic "impact" report by the Perryman Group, which is intended to show that the spending associated with the project, and the gas production it would create, would create economic benefits. This report suffers from essentially the same failure at the Deloitte document: It does not consider the economic situation without Golden Pass but with alternate economic choices. Simply put, if NERA – which is a highly pro-gas organization – is correct, LNG export depresses the rest of the economy. Synapse's work, and Dr. Tyner's, shows that this effect is likely more acute than NERA supposes. It also shows that increasing gas development comes along with long-term economic dislocation and reduced growth. The Perryman report does not address any of these points, and cannot do so because of its structure. It only shows that constructing and operating Golden Pass creates revenues and employment (unsurprisingly). It does not show, however, that the region and the country would not be better off with an alternate, non-export project of similar size – such as increased development of domestic industry, for instance.

The Perryman report cannot answer this crucial question because it is what is based on an "input-output assessment system."[57] As the report explains, it essentially works by mapping the paths of a given dollar amount of spending through the economy, by charting relationships between different industrial sectors (that is, an additional dollar in spending on construction leads to an additional dollar in hotel revenue for construction workers, and so on[58]). In essence, this methodology demonstrates that increased spending in one economic sector will increase spending in other sectors, relative to a case where no investment occurs.

This type of modeling suffers from numerous well-documented limits that lead it to drastically overstate economic benefits. These limitations are discussed in depth in 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").[59] Further limitations are discussed by David Kay, *The Economic Impacts of Marcellus Shale Gas Drilling: What Have We Learned? What are the Limitations?* (Apr. 2011).[60] Because of these limits, the GOLDEN PASS and NERA studies fail to acknowledge many of the drawbacks of exports.

In essence, such models cannot consider counterfactual scenarios. The Perryman Report maps the consequences of particular expenditures, rather than asking how the economy might have grown had investors and regulators made different choices. It does not consider how the particular choice at issue might displace other economic

[57] Perryman Report at 4.
[58] *See id.* at 49-52.
[59] Attached as Exhibit 15.
[60] Attached as Exhibit 16.

activity. The absence of counterfactual analysis is at the core of the Ohio Study's critique of input-output analyses in the gas production context.[61] As the Ohio Study explains, studies like the Perryman Report "do not include various displacement effects and do not reflect the true counterfactual of comparing what would have happened *without*" the activity in question. [62] Looking at the particular case of input-output models of oil and natural gas drilling, the Ohio Study explains that these omitted factors include "higher local wages and land costs, *which reduce employment that would have occurred elsewhere in the economy*. Likewise, the environmental effects may reduce activity in the tourism sector and other residents may not want to live near such degrading activity."[63]

Input-output models likewise cannot consider the distributional and structural changes in the economy a given investment can create. As we have already explained, and discuss at length in the attached economic reports, gas extraction is associated with significant long-term economic declines in communities that become dependent upon it. Because many of the Perryman's reports' predicted benefits come from gas production, after the initial construction work at the site, these declines are important. Supporting natural gas production may well not be to the nation's ultimate benefit.

The upshot is that Perryman Report can show that the construction and operation of Golden Pass would, of course, create and support some jobs and economic activity. It cannot, however, show that this decision is superior to an economic scenario in which exports do not occur; nor can it account for the significant long-term structural damage to the economy that increasing dependence on fossil fuel exports would cause.

Golden Pass's Trade Claims

Golden Pass also claims that it would benefit the U.S., and consumers, by expanding international trade, quoting the President's hope that he will see "folks in South Korea diriving Fords and Chevys and Chryslers" and products sold around the world "stamped with the three proud words 'Made in America'." App. at 27-28. The problem, as the attached economic reports show, is that Golden Pass would actually depress the U.S. manufacturing base. There would be fewer products stamped "Made in America" if its proposal goes forward. Trade-exposed industries suffer in a future with LNG exports, and especially those dependent on gas as a fuel or feedstock (such as the steel companies making frames for all those Fords and Chevys).[64] Golden Pass does not increase America's exports relative to a future with stronger manufacturing at home; it works to preclude that future.

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[61] Ohio Study, *supra* n.59, at 11.
[62] *Id.* (emphasis in original).
[63] *Id.*
[64] *See* Sierra Economic Comments at 10-13, Synapse Report at 5-6.

Conclusions

The truth is that Golden Pass's proposal, alone or considered in tandem with other export plans, will increase gas prices, lower wages, lower employment, and remove wealth from most of the economy, concentrating any gains with the narrow sector of the American economy that owns LNG and natural gas capital. Golden Pass's submissions claim benefits from its proposal, but fail to count any of these costs. They do not overcome the record already in this docket demonstrating that exports are not in America's economic interest, or in the public interest. Certainly, DOE/FE may not rely upon Golden Pass's one-sided information to approve its application.

D. The Project Will Have Significant Adverse Environmental Impacts Not Discussed in Golden Pass's Application

Golden Pass's proposal will not just do direct economic harm. It will also impose significant environmental costs. These impacts must be considered in the NEPA process, and will be better elucidated by it. Our discussion here is intended to illustrate them and to demonstrate that, on the existing record, the environmental consequences of the project are not in the public interest. DOE/FE, of course, will need to draw conclusions on this matter only after the NEPA process concludes.

These environmental impacts 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. The attached economic reports discuss the economic implications of many of these impacts, demonstrating that they are likely in the billions of dollars for the range of export projects before DOE/FE.[65] We incorporate that discussion, in full, by reference here.

1. Local Environmental Impacts

Construction and operation of liquefaction and associated export facilities at Golden Pass's existing terminal will have a range of adverse environmental effects. Because Golden Pass application to DOE/FE does not describe the particular equipment or facilities to be installed, and because Golden Pass has not submitted pre-filing resource reports or other specific plans to FERC at this time, it is impossible for Sierra Club to discuss these impacts in detail prior to DOE/FE's comment deadline. Nonetheless, DOE/FE must consider these impacts in its public interest analysis, and Sierra Club,

[65] *See* Sierra Economic Report at 29-52.

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 and the proceedings regarding construction of Golden Pass's present import terminal. 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

Both construction and operation phases of Golden Pass'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 (PM_{10} and $PM_{2.5}$), and hydrogen sulfide (H_2S).

VOC and NO_x

Liquefaction and export equipment will emit harmful amounts of VOC and NOx. 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 NOx when powered by simple-cycle gas turbines, as has been proposed for the Sabine Pass, Louisiana and Corpus Christi, Texas LNG export terminals.[66] Notably, these terminals are near Golden Pass's terminal, and so should be included in an assessment of its likely impacts for all pollutants.

These emissions will harm the environment because VOC and NOx 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.[67] Smog may also exacerbate existing respiratory illnesses, such as asthma and emphysema, or cause chest pain, coughing, throat irritation and congestion. Children, the elderly, and people with existing respiratory conditions are the most at risk from ozone pollution.[68] Significant

[66] Sabine Pass EA, *supra* n.265, 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).

[67] 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 17; 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 18.

[68] *See* EPA, *Ground-Level Ozone, Health Effects*, *available at* http://www.epa.gov/glo/health.html attached as Exhibit 19. EPA, Nitrogen Dioxide, Health, available at http://www.epa.gov/air/nitrogenoxides/health.html, attached as Exhibit 20.

ozone pollution also damages plants and ecosystems.[69] Emissions from the terminal site are particularly troubling because baseline air quality in the project area already approaches, if not exceeds, national ambient air quality standards for ozone.[70]

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.[71]

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.[72] 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.[73] 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.[74]

CO can cause harmful health effects by reducing oxygen delivery to the body's organs and tissues.[75] 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."[76]

GHGs

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[69] O&G NSPS RIA, *supra* n.67, at 4-26.

[70] EPA, Comment on draft EIS at 5; EPA, Comment on final EIS, FERC Dkt. CP06-12, at 2 (Jan. 3, 2007) attached as Exhibit 21. In these comments, EPA noted that some evidence indicated ambient air quality near the terminal of 85 ppb ozone, exceeding what was then the standard of 80 ppb. This standard has since been lowered to 75 ppb. *National Ambient Air Quality Standard for Ozone*, 73 Fed. Reg. 16436 (Mar. 27, 2008).

[71] *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 www.unep.org/dewa/Portals/67/pdf/Black_Carbon.pdf), at 7, attached as Exhibit 22.

[72] Sabine Pass EA, *supra* n.265, at 2-56 t.2.7-7.

[73] *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").

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

[75] EPA, Carbon Monoxide, Health, http://www.epa.gov/air/carbonmonoxide/health.html, last visited Dec. 14, 2012, attached as Exhibit 23.

[76] *Id.*

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 dioxide equivalent in greenhouse gases.[77] 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."[78] 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.[79] 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.[80] 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 SO_2, with an additional 80.88 tpy emitted by marine vessel traffic.[81] 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.[82] 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.[83]

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[77] Sabine Pass EA, *supra* n.265, at 2-57 t.2.7-8, Oregon LNG RR, *supra* n.73 at RR 9-16 to 9-19.
[78] 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)).
[79] *Id.* at 66,532–33.
[80] EPA, *Climate Change, Health and Environmental Effects*, *available at* http://epa.gov/climatechange/effects/health.html, attached as Exhibit 24.
[81] Oregon LNG RR, *supra* n.73, at 9-16 to 9-19.
[82] EPA, Sulfur Dioxide, Health, *available at* http://www.epa.gov/air/sulfurdioxide/health.html, attached as Exhibit 25.
[83] Oregon LNG RR, *supra* n.73, at 9-16 to 9-19.

PM consists of tiny particles of a range of sizes suspended in air. Small particles pose the greatest health risk. These small particles include "inhalable coarse particles," which are smaller than 10 micrometers in diameter (PM_{10}), and "fine particles" which are less than 2.5 micrometers in diameter ($PM_{2.5}$). PM_{10} is primarily formed from crushing, grinding or abrasion of surfaces. $PM_{2.5}$ is primarily formed by incomplete combustion of fuels or through secondary formation in the atmosphere.[84]

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 PM_{10} and 99 tpy of $PM_{2.5}$ fugitive dust emissions, even after application of dust suppressant controls.[85]

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.[86] PM also reduces visibility,[87] and may damage important cultural resources.[88] 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.[89]

b. Water Quality Impacts

The proposed project may impact water quality in numerous ways. Construction may require water withdrawals, and terminal operations could result in stormwater runoff and discharge and suspension or re-suspension of sediment as a result of dredging and ship transits. Construction may also require wetlands fill, with associated impacts. Stormwater from the terminal site could contain heavy metals, petroleum products and brake chemicals and compounds that are deleterious to fish and fish habitat. In addition, dredging, construction of in-water facilities, and ship transits all have the potential to suspend or re-suspend sediment, adversely affecting water quality.

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[84] *See* EPA, Particulate Matter, Health, *available at* http://www.epa.gov/pm/health.html, attached as Exhibit 26; 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.

[85] Sabine Pass EA, *supra* n.265, at 2-52 t.2.7-4.

[86] O&G NSPS RIA, *supra* n.67, at 4-19; EPA, Particulate Matter, Health

[87] EPA "Visibility – Basic Information" http://www.epa.gov/visibility/what.html, attached as Exhibit 27.

[88] *See* EPA, Particulate Matter, Health, *supra* n.84; West Tavaputs EIS, *supra* n.84, at 3-19; O&G NSPS RIA, *supra* n.67, at 4-24.

[89] UNEP Report at 6; IPCC (2007) at Section 2.4.4.3.

c. Environmental Justice and Cumulative Impacts

The Golden Pass facility would be constructed and operated in an area that is already at the center of the U.S. petrochemical industry, and near several other potential LNG export sites. The cumulative impact of this pollution very likely disproportionately impacts the citizens of this region of the Gulf Coast, raising their pollution exposure well above that suffered by comparable regions. DOE must consider this cumulative pollution burden.

d. Fish and Wildlife

The proposed project can be expected to impact wildlife and species habitat in numerous ways. The Sierra Club intends to submit comments during the NEPA process that more fully explore species impacts in light of the project design.

2. Induced Gas Production

The environmental and economic cost of Golden Pass's terminal itself represents only a small portion of the project's environmental (and, hence, economic) cost. As Golden Pass explains, its terminal will "provide a new market for U.S. production that would have otherwise been slower to develop." App. at 19. It is intended to connect to a range of supply sources in Texas and the Gulf region, and will cause "continue[d] growth" in U.S. gas production that would not otherwise have occurred. *See id*. at 20. A significant portion of the benefits Golden Pass claims to support its public interest application arise from this increased production. *Id.* at 27. Certainly, such production will occur. But DOE/FE must consider both sides of the ledger. Increased gas production comes with significant environmental costs which must be considered.

Available tools 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. Golden Pass's Proposal Will Induce Additional U.S. Gas Production

Golden Pass's application and supporting reports, and the EIA, agree that exports will induce additional production. EIA has the capacity to predict where this additional production will occur, and the Deloitte report submitted by Golden Pass actually predicts the volume of additional production that will occur as a result of Golden Pass's export proposal.

The EIA predicts that "about 60 to 70 percent" 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."[90] Golden Pass's application agrees that its project affirms this prediction. The Deloitte report predicts that about "63% of the total incremental volume" for export comes from increased production.[91] Deloitte's estimate is likely too low, because it appears not to account for the gas consumed in the liquefaction process: EIA's 60 to 70% figures are percentages of total gas demand created by exports, not percentages of gas actually exported.[92] Adding this gas increases total demand by roughly 10%.[93]

Both EIA and Deloitte have tools to predict where this additional production will occur. EIA's core analytical tool is the National Energy Modeling System ("NEMS"). NEMS was used to produce the EIA exports study. NEMS models the economy's energy use through a series of interlocking modules that represent different energy sectors on geographic levels.[94] 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*.[95] 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.[96] 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.[97] 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.[98]

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.[99] As EIA explains, "production type curves have been used to estimate the technical

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[90] *Id.* at 6.
[91] Deloitte Report at 15.
[92] EIA Export Study at 2.
[93] *Id.*
[94] EIA, *The National Energy Modeling System: An Overview*, 1-2 (2009), attached as Exhibit 28, available at http://www.eia.gov/oiaf/aeo/overview/pdf/0581(2009).pdf.
[95] *Id.* at 59.
[96] EIA, *Model Documentation: Natural Gas Transmission and Distribution Module of the National Energy Modeling System*, 15-16 (2012), attached as Exhibit 29, *available at* http://www.eia.gov/FTPROOT/modeldoc/m062(2011).pdf.
[97] *See id.* at 22-32.
[98] *See id.* at 30-31.
[99] EIA, *Documentation of the Oil and Gas Supply Module*, 2-2 (2011), attached as Exhibit 30, *available at* http://www.eia.gov/FTPROOT/modeldoc/m063(2011).pdf.

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."[100] The module distinguishes coalbed methane, shale gas, and tight gas from other resources, allowing for specific predictions distinguishing unconventional gas supplies from conventional supplies.[101] The module further projects the number of wells drilled each year, and their likely production – which are important figures for estimating environmental impacts.[102] 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."[103] Thus, for each play in the lower 48 states, the EIA is able to 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."[104]

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.

Golden Pass's own application includes play-specific predictions of how production will increase in response to Golden Pass's proposal.[105] Deloitte explains that its "World Gas Model" includes detailed global gas resources, including modeling of "575 plays in the US alone."[106] 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."[107] This includes modeling individual "producers, pipelines, refineries, ships, distributors, and consumers."[108]

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.

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[100] *Id.* at 2-3.
[101] *Id.* at 2-7.
[102] *See id.* at 2-25 to 2-26.
[103] *Id.* at 2-3.
[104] *Id.*
[105] Deloitte Report at 25.
[106] *Id.*
[107] *Id.* at 24.
[108] *Id.*

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.

The legal obligation under the NGA is straightforward. As DOE/FE has acknowledged, and as the Supreme Court has instructed, "environmental considerations" necessarily must inform the public interest analysis. Induced production's environmental impacts are among the most important of these considerations, and so must be accounted for. Failing to do so would arbitrarily and capriciously skew DOE/FE's analysis. Golden Pass claims the benefits of induced production as a rationale for granting its application. If DOE/FE gives these supposed benefits any weight, it must also consider their costs, or it will have impermissibly ignored an important part of the problem before it. *See* 5 U.S.C. § 706(2)(A).

NEPA also clearly requires such analysis. 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. 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. For example, 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*. *Accord Mid States Coalition for Progress v. Surface Transp. Bd.*, 345 F.3d 520, 548-550 (8th Cir. 2003).

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.[109] *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 impacts of natural gas production induced by GOLDEN PASS'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."[110] EPA used similar language regarding the Oregon LNG proposal.[111] 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.[112]

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.[113] 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.[114]

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

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[109] 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.

[110] EPA, *Scoping Comments – The Jordan Cove Energy Project LP*, *supra* n.19, at 14.

[111] EPA, *Scoping Comments – The Oregon LNG Export Project and Washington Expansion Project*, *supra* n.21

[112] EPA, *Scoping Comments – Cove Point Liquefaction Project*, *supra* n.20, at 2-3 (emphasis added).

[113] 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)).

[114] DOE/FE Order 2961-B, Jan. 25, 2013.

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 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, if exports occur, an aggregate production increase is unarguably "reasonably foreseeable."

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).

The 8th Circuit explained this point precisely in *Mid State*. There, a federal regulator declined to consider the air quality impacts of increased coal availability resulting from a proposed rail line, asserting that it could not know exactly where coal plants would be built or how much coal would be used. *See* 354 F.3d at 550. The Court refused to allow

this excuse, explaining that "when the *nature* of the effect is reasonably foreseeable but its *extent* is not, we think that the agency may not simply ignore the effect." *Id.* (emphasis in original). The agency was obligated to explain the basic scope of the effects, even if it could not localize all impacts. *Id.*

But, 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 GOLDEN PASS'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. Environmental Harm Resulting from Induced Production

Natural gas production—from both conventional and unconventional sources—is a significant air pollution source, can disrupt ecosystems and watersheds, leads to industrialization of entire landscapes, and presents challenging waste disposal issues. EIA 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.[115] 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. DOE, Secretary of Energy's Advisory Board, *Shale Gas Production Subcommittee Second 90-Day Report* (2011) at 10.[116] 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.

[115] EIA Export Study, *supra* n. 48, at 11.
[116] Attached as Exhibit 31. *See also* DOE, Shale Gas Production Subcommittee First 90-Day Report, attached as Exhibit 32.

i. Natural Gas Production is a Major Source of Air Pollution and Golden Pass Will Increase Such Pollution

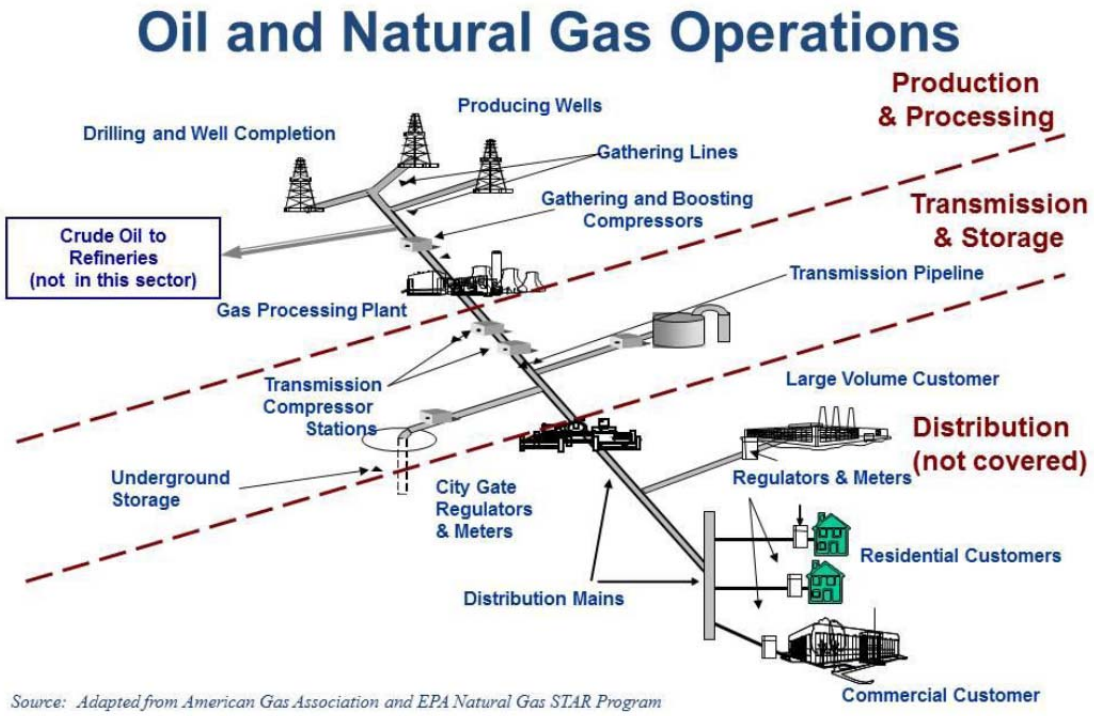
Below, we briefly describe some of the primary air pollution problems caused by the industry. These issues include direct emissions from production equipment and indirect emissions caused by natural gas replacing cleaner energy sources. *See* Figure 1, below. EPA has moved to correct some of these problems 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 even if EPA's rules are finalized.

Air Pollution Problems from Natural Gas

Natural gas production operations emit methane (CH_4), volatile organic compounds (VOCs), nitrogen oxides (NO_x), sulfur dioxide (SO_2), hydrogen sulfide (H_2S), and particulate matter (PM_{10} and $PM_{2.5}$). 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) natural gas transmission, and (4) natural gas distribution.[117] 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.

[117] EPA, Oil and Natural Gas Sector: Standards of Performance for Crude Oil and Natural Gas Production, Transmission, and Distribution, Background Technical Support Document for the Proposed Rules ("TSD") at 2-4 (July 2011) ("2011 TSD"), attached as Exhibit 33.

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.[118] 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 about 4.8% of production[119] A second NOAA study, recently announced, suggests that leak rates may be as high as 9%, suggesting even more severe consequences.[120]

[118] 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 34.
[119] *Id.* at 4304.
[120] J. Tollefson, *Methane leaks erode green credentials of natural gas*, Nature (2013), attached as Exhibit 35.

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.[121] Elevated levels of these pollutants correspond to increased cancer risks for people living within half of a mile of a well[122] – 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."[123] The industry is responsible for over 40% of total U.S. methane emissions.[124] 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.[125] Because of methane's effects on climate, EPA has found that methane, along with five other well-mixed greenhouse gases, endangers public health and welfare within the meaning of the Clean Air Act.[126] The oil and gas production industry is a significant emitter of this dangerous pollutant; its methane

[121] 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 36.
[122] *Id.* at 2.
[123] 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). 76 Fed. Reg. 52,738, *supra* n.78, at 52,792.
[124] *Id.* at 52,791–92.
[125] *IPCC 2007—The Physical Science Basis*, Section 2.10.2, and *IPCC 2007- Summary for Policymakers*, attached as Exhibit 37. 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.
[126] 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 38.

emissions amount to 5% of all carbon dioxide equivalent (CO_2e) emissions in the country.[127]

Methane also reacts in the atmosphere to form ozone.[128] 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.[129] VOCs are emitted from well drilling and completions, compressors, pneumatic devices, storage tanks, processing plants, and as fugitives from production and transmission.[130] The primary sources of NO_x are compressor engines, turbines, and other engines used in drilling and hydraulic fracturing.[131] NO_x is also produced when gas is flared or used for heating.[132]

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.[133] Of the nine counties surrounding the Dallas Fort Worth area that EPA has designated as "nonattainment" for ozone, five contain significant oil and gas development.[134] 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.[135]

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[127] 76 Fed. Reg. 52,738, *supra* n.123, at 52,791–92.
[128] *Id.* at 52,791.
[129] *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 39.
[130] *See, e.g.,* 2011 TSD at 4-7, 5-6, 6-5, 7-9, 8-1; *see also* Barnett Shale Report at 24.
[131] *See, e.g.*, 2011 TSD at 3-6; Barnett Shale Report, *supra* n.129, at 24; Air Quality Impact Analysis Technical Support Document for the Revised Draft Supplemental Environmental Impact Statement for the Pinedale Anticline Oil and Gas Exploration and Development Project at 11 (Table 2.1).), attached as Exhibit 40.
[132] 2011 TSD at 3-6; Colorado Department of Public Health and Environment, *Colorado Visibility and Regional Haze State Implementation Plan for the Twelve Mandatory Class I Federal Areas in Colorado*, Appendix D at 1 (2011), available at http://www.cdphe.state.co.us/ap/RegionalHaze/AppendixD/4-FactorHeaterTreaters07JAN2011FINAL.pdf, attached as Exhibit 41.
[133] Texas Railroad Commission history of Barnett Shale, attached as Exhibit 42.
[134] Barnett Shale Report at 1, 3.
[135] *Id.* at 1, 25-26.

Oil and gas development has also brought serious ozone pollution problems to rural areas, such as western Wyoming.[136] On March 12, 2009, the governor of Wyoming recommended that the state designate Wyoming's Upper Green River Basin as an ozone nonattainment area.[137] 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."[138] 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.[139] Residents have faced repeated warnings regarding elevated ozone levels and the resulting risks of going outside.[140]

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 standard.[141] 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,

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[136] 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 43.

[137] *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 44; 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 45.

[138] Wyoming Nonattainment Analysis at viii.

[139] 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 46; *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 47.

[140] *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 48; 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 49.

[141] 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 50.

ozone pollution levels climbed to nearly twice the federal standard.[142] 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.[143]

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.[144] Moreover, significant additional drilling has occurred since 2008. Colorado is now home to more than 46,000 wells.[145] 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.[146] 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.[147]

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 lands[148] – 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

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[142] *See* EPA, AirExplorer, Query Concentrations (Ozone, Uintah County, 2011), available through the http://www.epa.gov/airexplorer/ website and attached as Exhibit 51.

[143] 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 52.

[144] 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 53.

[145] 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 54.

[146] *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 55.

[147] 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 56.

[148] *See* 42 U.S.C. § 7472(a).

Wilderness Area in New Mexico.[149] These areas are all near concentrated oil and gas development in the San Juan Basin.[150]

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.[151]

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.[152] 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."[153] 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.[154]

Sulfur dioxide: Oil and gas production also emits sulfur dioxide, primarily from natural gas processing plants.[155] Sulfur dioxide is released as part of the sweetening process, which removes hydrogen sulfide from the gas.[156] Sulfur dioxide is also created when gas containing hydrogen sulfide (discussed below) is combusted in boilers or heaters.[157]

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[149] 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 57.
[150] *Id.* at 1112.
[151] *See* Kemball-Cook et al., *Ozone Impacts of Natural Gas development in the Haynesville Shale* 44 Environ. Sci. Technol. 9357, 9362 (2010), attached as Exhibit 58.
[152] L. McKenzie *et al.*, *Human health risk assessment of air emissions from development of unconventional natural gas resources*, Science of the Total Environment (2012), attached as Exhibit 36.
[153] *Id.* at 5.
[154] *See* L. Vandenberg *et al.*, *Hormones and Endocrine-Disrupting Chemicals: Low-Dose Effects and Nonmonotonic Dose Responses*, Endocrine Disruption Review (2012), attached as Exhibit 59.
[155] 76 Fed. Reg., *supra* n.123, at 52,756.
[156] TSD, *supra* n.117, at 3-3 to 3-5.
[157] 76 Fed. Reg. , *supra* n.123, at 52,756.

Hydrogen sulfide: Some natural gas contains hydrogen sulfide. Gas containing hydrogen sulfide above a specific threshold is classified as "sour gas."[158] According to EPA, there are 14 major areas in the U.S., found in 20 different states, where natural gas tends to be sour.[159] All told, between 15 and 20% of the natural gas in the U.S. may contain hydrogen sulfide.[160]

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."[161] Hydrogen sulfide may be emitted during all stages of development, including exploration, extraction, treatment and storage, transportation, and refining.[162] For example, hydrogen sulfide is emitted as a result of leaks from processing systems and from wellheads in sour gas fields.[163]

Hydrogen sulfide emissions from the oil and gas industry are concerning because this pollutant may be harmful even at low concentrations.[164] 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.[165] Although hydrogen sulfide was originally included in the Clean Air Act's list of hazardous air pollutants, it was removed with industry support.[166]

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.[167] People in northwest New Mexico and western Colorado living near gas wells have long complained of strong odors, including

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[158] *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.*

[159] 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 60.

[160] 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 61.

[161] EPA Hydrogen Sulfide Report, *supra* n. 159, at III-35.

[162] *Id.* at ii.

[163] TSD, *supra* n.117, at 2-3.

[164] *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 62.

[165] EPA Hydrogen Sulfide Report, *supra* n. 159, at ii.

[166] *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.

[167] EPA Hydrogen Sulfide Report, *supra* n. 159, 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.[168] 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.[169]

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.[170] 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 $PM_{2.5}$.[171]

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.[172] These elevated levels of $PM_{2.5}$ have been linked to oil and gas activities in the Uinta Basin.[173] Modeling also shows that road traffic associated with energy development is pushing PM_{10} levels very close to violating NAAQS standards.[174]

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 pollutants[175] do reduce some of these pollution problems, they will not solve them. The rules, first, do not even address some pollutants, including NO_x, methane, and hydrogen sulfide, so any reductions of these pollutants occur only as co-benefits of the VOC reductions that the rules require.[176] Second, the rules do not control emissions from most transmission infrastructure.[177] 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

[168] See Global Community Monitor, *Gassed! Citizen Investigation of Toxic Air Pollution from Natural Gas Development*, at 11-14 (2011), attached as Exhibit 63.
[169] *Id.* at 21.
[170] *See* BLM, GASCO Energy Inc. Uinta Basin Natural Gas Development Project Draft Environmental Impact Statement, at App. J at 2 (Oct. 2010) ("GASCO DEIS").
[171] O&G NSPS RIA, *supra* n.67, at 4-18.
[172] GASCO DEIS, *supra* n.170, at 3-12.
[173] West Tavaputs FEIS, *supra* n.84, at 3-20.
[174] *See* GASCO DEIS, *supra* n.170, at 4-27.
[175] *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.
[176] *See id.* at 49,513-14.
[177] *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.

Emissions from Golden Pass's Exports Alone Will Be Significant

As we have discussed above, Golden Pass proposed to export about 740 bcf per year of natural gas, or on the order of 2.4 bcf/d (although DOE/FE's online chart lists 2.6 bcf/d of export – a discrepancy that DOE/FE should address). Both Deloitte and the EIA predict that about 63% of this export will come from new production.

EPA conversion factors allow us to estimate the emissions impacts of this new production. EPA's current greenhouse gas inventory implies that about 2.4% of gross gas production leaks to the atmosphere in one way or another.[178] More recent work by National Oceanic and Atmospheric Administration ("NOAA") scientists based on direct measurement at gas fields, again suggests that this leak rate may be actually between 4.8% and 9%, at least in some fields.[179] These leak rates, and EPA conversion factors between the typical volumes of methane, VOC, and HAP in natural gas,[180] 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 740 bcf of gas, the volume that Golden Pass wishes to export. 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 of 2.4%, and the higher leak rates the NOAA studies suggest, generating results for methane, VOC, and HAP. [181]

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[178] 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 64.

[179] *See* G. Petron *et al.*, *Hydrocarbon emissions characterization in the Colorado Front Range – A pilot study*, Journal of Geophysical Research (2012); J. Tollefson, *Methane leaks erode green credentials of natural gas*, Nature (2013).

[180] *See* EPA, 2011 TSD 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.

[181] 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.

Export Volume of 740 bcf/year	Methane (tons)	VOC (tons)	HAP (tons)
1% Leak Rate	96,970	14,148	1,028
2.4% Leak Rate	232,727	33,955	2,467
4.8% Leak Rate	465,454	67,910	4,934
9% Leak Rate	872,726	127,331	9,251

Thus, Golden Pass, alone, would be responsible for hundreds 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. Golden Pass 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 Poses Risks to Ground and Surface Water

As noted above, most of the increased production that would result Golden Pass's proposal will likely be from shale and other unconventional gas sources, and producing gas from these sources requires hydraulic fracturing, or fracking.[182] Hydraulic fracturing involves injecting a base fluid (typically water),[183] 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.[184] In the Gulf States' shale formations (Barnett, Haynesville,

[182] *See* DOE, Shale Gas Production Subcommittee First 90-Day Report at 8.

[183] 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.

[184] TNC, Pennsylvania Energy Impacts Assessment, Report 1: Marcellus Shale Natural Gas and Wind 10, 18 (2010), attached as Exhibit 65. *Accord* N.Y. Dep't of Envtl. Conservation, Revised Draft Supplemental General Environmental Impact Statement on the Oil, Gas and Solution Mining Regulatory Program, 5-5 (2011) ("NY RDSGEIS") at 6-10, available at http://www.dec.ny.gov/energy/75370.html ("Between July 2008 and February 2011, average water usage for high-volume hydraulic fracturing within the

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.[185] Fresh water constitutes 80% to 90% of the total water used to frack a well even where operators recycle "flowback" water from the fracking of previous wells for use in drilling the current one.[186] Many wells are fractured multiple times over their productive life.

DOE/FE can and must predict the number of wells that will be needed to provide the volume of gas exported. We provide an unrealistically conservative (i.e., industry-friendly) estimate here to illustrate the magnitude of the problem, although DOE/FE can and must engage in a more sophisticated analysis of the issue. As noted above, EIA predicts that at least 63% percent of the gas exported will come from additional production, and that roughly 72% of this production will come from shale gas sources, with an additional 23% coming from other unconventional gas reserves. The USGS has estimated that even in the most productive formations, average expected ultimate recoveries for unconventional shale gas wells are less than 3 bcf, and that most formations provided drastically lower average expected ultimate recoveries.[187] As noted above, the average horizontal fracked well requires roughly 4 million gallons of water, at least 80% of which (3.2 million gallons) is new fresh water.[188] Thus, if Golden Pass seeks to export 740 bcf of gas per year, and 63% of that gas is drawn from new production, that new production will require approximately 246 new wells, which will in turn require 789 million gallons of freshwater.

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").

[185] 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 Ex 54; 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 67**.** 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 (2012), at 19.

[186] NY RDSGEIS at 6-13, *accord* Nicot 2012, *supra* n.184, at 54.

[187] USGS, *Variability of Distributions of Well-Scale Estimated Ultimate Recovery for Continuous (Unconventional) Oil and Gas Resources in the United* States, USGS Open-File Report 212-1118 (2012), attached as Exhibit 68**.** Although some oil and gas producers have publicly stated higher expected ultimate recoveries, DOE/FE must begin with the data-backed assessment of its expert and impartial sister agency.

[188] Taking the most industry friendly of each of these values is particularly unrealistic because the values are not independent. For example, higher-producing wells are likely to be wells with a longer fracked lateral, which are in turn wells that use higher volumes of water. Using the high range of the average expected ultimate recovery but the low range of the average water requirement therefore represents a combination unlikely to occur in reality.

These water withdrawals would drastically impact aquatic ecosystems and human communities. Their effects are larger than their raw volumes because withdrawals would be concentrated in particular watersheds and regions. Reductions in instream flow negatively affect aquatic species by changing flow depth and velocity, raising water temperature, changing oxygen content, and altering streambed morphology.[189] Even when flow reductions are not themselves problematic, the intake structures can harm aquatic organisms.[190] 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 withdrawal, because fracking is a consumptive use. Fluid injected during the fracking process is (barring accident) deposited below freshwater aquifers and into sealed formations.[191] 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.

The impacts of withdrawing this water – especially in arid regions of the west – are large, and can greatly change the demand upon local water systems. A recent Environment America report notes, for instance, that fracking is expected to comprise 40% of water consumption in one county in the Eagle Ford shale region of Texas, for example.[192] As fracking expands, and operators seek to secure water rights to divert water from other uses, these withdrawal costs will also rise. Because Golden Pass will likely be drawing gas from these regions, these risks are particularly acute.

Groundwater Contamination

Gas extraction activities pose a substantial 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.

Once groundwater is contaminated, the clean-up costs are enormous. The Environment America report, for instance, documents costs of over $109,000 for methane removal

[189] *Id.* 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.
[190] *Id.* at 6-4.
[191] *Id.* at 6-5; First 90-Day Report at 19 ("[I]n some regions and localities there are significant concerns about consumptive water use for shale gas development.").
[192] Environment America, *The Costs of Fracking* (2012) at 26, attached as Exhibit 70.

for just 14 households with contaminated groundwater.[193] EPA has estimated treatment costs for some forms of groundwater remediation at between $150,000 to $350,000 per acre.[194] Such costs can continue for years, with water replacement costs adding additional hundreds of thousands in costs.[195] Indeed, a recent National Research Council report observed that for many forms of subsurface and groundwater hazardous chemical contamination, "significant limitations with currently available remedial technologies" make it unlikely that contaminated aquifers can be fully remediated "in a time frame of 50-100 years."[196]

There are several vectors by which gas production can contaminate groundwater supplies. Perhaps the most common or significant are inadequacies in the casing of the vertical well bore.[197] 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.[198]

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.[199] One 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.[200]

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

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[193] *Id.* at 13.
[194] *Id.* at 14.
[195] *Id.*
[196] National Research Council, *Prepublication Copy- Alternatives for Managing the Nation's Complex Contaminated Groundwater Sites*, ES-5 (2012), executive summary attached as Exhibit 71**,** full report available at http://www.nap.edu/catalog.php?record_id=14668#toc.
[197] DOE, Shale Gas Production Subcommittee First 90-Day Report at 20.
[198] 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), at 5-9, attached as Exhibit 72.
[199] Comment on NY RDSGEIS, attachment 3, Report of Tom Myers, at 12-15.
[200] Tom Myers, *Potential Contaminant Pathways from Hydraulically Fractured Shale to Aquifers* (Apr. 17, 2012), attached as Exhibit 73.

surrounding a producing shale production site in northern Pennsylvania."[201] 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.[202] Two other reports "have documented or suggested the movement of fracking fluid from the target formation to water wells linked to fracking in wells."[203] "Thyne (2008)[[204]] had found bromide in wells 100s of feet above the fracked zone. The EPA (1987)[[205]] 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."[206]

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."[207] EPA tested water from wells extending to various depths within the range of local groundwater. At the deeper tested wells, EPA discovered inorganics (potassium, chloride), synthetic organic (isopropanol, glycols, and tert-butyl alcohol), and organics (BTEX, gasoline and diesel range organics) at levels higher than expected.[208] At shallower levels, EPA detected "high concentrations of benzene, xylenes, gasoline range organics, diesel range organics, and total purgeable hydrocarbons."[209] 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.[210] The U.S. Geological Survey, in cooperation with

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[201] 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 74)

[202] *Id.*

[203] Comment on NY RDSGEIS, attachment 3, Report of Tom Myers, at 13.

[204] 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.

[205] 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 75.

[206] Comment on NY RDSGEIS, attachment 3, Report of Tom Myers, at 13.

[207] 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 Ex 64. 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).

[208] *Id.* at xii.

[209] *Id.* at xi.

[210] *Id.* at xi, xiii.

the Wyoming Department of Environmental Quality, also provided data regarding chemicals found in wells surrounding Pavillion.[211] 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.[212]

EPA also identified elevated levels of hazardous substances in home water supplies near Dimock, Pennsylvania.[213] 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.[214] Arsenic, barium, and manganese were present in five home wells "at levels that could present a health concern."[215] 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."[216] The PADEP information provided reason to believe that drilling activities in the area led to contamination of these water supplies. Drilling in the area began in 2008, and was conducted using the hazardous substances that have since been discovered in well water. 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, [217] the Dimock example indicates the potential for gas development to contaminate groundwater.

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[211] 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 76.

[212] Tom Myers, *Assessment of Groundwater Sampling Results Completed by the U.S. Geological Survey* (Sept. 30, 2012), attached as Exhibit 77. 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 78. *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 79.

[213] 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.epaosc.org/sites/7555/files/Dimock%20Action%20Memo%2001-19-12.PDF, attached as Exhibit 80; EPA, *EPA Completes Drinking Water Sampling in Dimock, Pa.* (Jul. 25, 2012), attached as Exhibit 81.

[214] *Id.* at 1, 3-4.

[215] *EPA Completes Drinking Water Sampling in Dimock, Pa.*

[216] *Id.* at 1.

[217] *Id.*

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.

Surface Water Contamination

Of course the same chemicals that can contaminate groundwater can also contaminate surface water, either through spills or communication with groundwater, or simply through dumping or improper treatment. Even the extensive road and pipeline networks created by gas extraction come with a risk of significant stormwater and sediment run-off which can contaminate surface waters. Gas field operations themselves, with their significant waste production and spill potential exacerbate these risks.

The Environment America report, for instance, documents fish kills caused by pipeline ruptures in the Marcellus Shale region, which impose costs on Pennsylvania's multi-billion dollar recreational fishing industry.[218] Such risks will be intensified by extraction for export.

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.[219] 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

[218] *The Cost of Fracking* at 20.
[219] *See, e.g.,* NY RDSGEIS, at 1-12.

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 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.[220]

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.[221] 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."[222] 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."[223] 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.[224] In light of these effects, Ohio and Arkansas have placed moratoriums on injection in the affected areas.[225] The recently released abstract of a forthcoming United States Geological Survey study affirms the connection between disposal wells and earthquakes.[226]

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[220] *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 82.
[221] 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 83.
[222] *Id.*
[223] *Id.*
[224] *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 84.
[225] 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 85.
[226] 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&-

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:

> 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.[227]

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.[228]

iii. 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.

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format=%2Fmeetings%2F2012%2Fabstracts%2Fsessionabstractdetail.html&-lay=MtgList&-find, attached as Exhibit 86.

[227] Comment on NY RDSGEIS, attachment 3, Report of Glen Miller, at 13.

[228] *Id.* at 4.

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."[229] New York's Department of Environmental Conservation reached similar estimates. After initial 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.[230] 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.[231]

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."[232] "Research has shown measureable impacts often extend at least 330 feet (100 meters) into forest adjacent to an edge."[233]

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

[229] TNC, Pennsylvania Energy Impacts Assessment, Report 1: Marcellus Shale Natural Gas and Wind 10, 18 (2010), attached as Exhibit 87.
[230] Id. at 6-13.
[231] *Id.* at 6-68.
[232] Pennsylvania Energy Impacts Assessment at 10.
[233] NY RDSGEIS at 6-75.

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;

- 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.[234]

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

[234] Pennsylvania Energy Impacts Assessment at 29.

planning,[235] 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.[236]

To be sure, Golden Pass will draw its gas from fields nearer to the Gulf, but these results are still instructive, because the pattern of development of gas fields is consistent across the country. As fields expand in response to export, so, too, will their impacts. 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 harm endangered species in regions where production would increase in response to Golden Pass'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.

d. Other Nationwide and Global Impacts

i. Changes in Domestic Power Production

Golden Pass'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 secondarily to renewable sources.[237] 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).[238]

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.[239] Thus, the EIA Export Study demonstrates that exports will harm the local environment by causing the opposite shift here.

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[235] *See id.*

[236] Penn. Dep't of Conservation and Natural Resources, Impacts of Leasing Additional State Forest for Natural Gas Development (2011), attached as Exhibit 88.

[237] EIA Export Study, *supra* n.48, at 6; *see also id.* at 17 ("[H]igher natural gas prices lead electric generators to burn more coal and less natural gas.").

[238] *Id.* at 18.

[239] EPA, Air Emissions, http://www.epa.gov/cleanenergy/energy-and-you/affect/air-emissions.html (last visited Dec. 12, 2012), attached as Exhibit 89.

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.

Table 1: Cumulative CO_2 Emissions from 2015 to 2035 With Various Export Scenarios[240]

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.[241] 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.[242] 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,[243] is not in the public interest.

[240] From the *EIA Export Study* at 19.
[241] Standards of Performance for Greenhouse Gas Emissions for New Stationary Sources: Electric Utility Generating Units, 77 Fed. Reg. 22,392 (Apr. 13, 2012).
[242] *See id.* at 22,430.
[243] *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).

ii. Effects on Global Greenhouse Gas Emissions

Although domestic substitution of coal for gas in response to exports will harm the public interest, DOE/FE must reject Golden Pass's unsupported assertion that the reverse holds true for countries that receive U.S. LNG. That is, Golden Pass 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 30-31. The available evidence indicates that such a benefit is unlikely. Golden Pass's argument is wrong for two reasons.

The International Energy Association'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.[244] 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.[245] 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 CO_2 levels stabilizing at over 650 ppm and global warming in excess of 3.5 degrees Celsius, "well above the widely accepted 2°C target."[246] 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.[247] 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, CO_2 emissions "do not begin to transition to a trajectory that many scientists believe is necessary to avoid dangerous impacts from climate change."[248]

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. This is because LNG has life-cycle emissions that are significantly higher than other

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[244] 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 90.
[245] *Id.* at 80.
[246] *Id.*
[247] 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 91.
[248] *Id.* at 98.

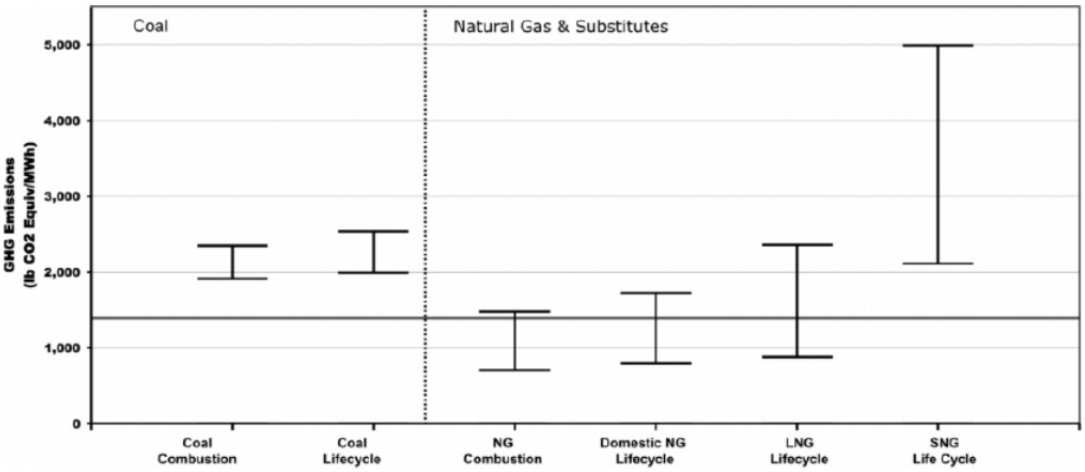
sources of natural gas. Liquefying natural gas is an energy intensive process. Additional energy is then consumed in the transportation of the gas, with attendant greenhouse gas emissions. Finally, the LNG must be regasified at the import terminal, often through the use of heat generated by the burning of yet more natural gas. These operations drastically increase the lifecycle greenhouse gas emissions of LNG, adding between 13.85 and 51.7 pounds of CO_2e per MMBtu.[249]

Emissions from liquefaction, transportation and gasification mean that the greenhouse gas emissions associated with LNG are significantly higher than those associated with domestic natural gas. For perspective, natural gas *combustion* emits roughly 120 pounds of CO_2e per MMBtu.[250] Using the above conservative figures, the process of liquefying, transporting, and regasifying LNG accordingly emits 19% to 23% of the CO_2e emitted by natural gas combustion itself—a substantial increase. Jaramillo 2007 concluded that this increase could bring LNG's lifecycle greenhouse gas emissions into parity with coal:

[249] 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 92. 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 93 ("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 94.

[250] *See, e.g.*, Jaramillo Supporting Info at 9.

Figure 2: Life-Cycle Emissions of LNG, Natural Gas, and Coal in Electricity Generation[251]



Moreover, Jaramillo's analysis understates 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. The Jaramillo studies were conducted prior to the shale gas boom. Some studies have found shale gas production's methane emissions to be drastically higher than those of conventional gas production. Moreover, in April 2011 (well after the Jaramillo studies were published), EPA released improved methodologies for estimating fugitive methane emissions from all natural gas systems (unconventional and otherwise), which lead to higher estimates.[252]

These recent studies estimate that aggregate domestic natural gas production releases at least 44 pounds of CO_2e per MMBtu. A report from the Worldwatch Institute and Deutsche Bank summarizes much of the recent work.[253] 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,[254] Mohan Jiang et al. of Carnegie-Mellon,[255] and Timothy Skone of NETL.[256] The Worldwatch Report separately derived a "top-down" estimate, which produced a result

[251] From Jaramillo 2007, *supra* n.249, at 6,295. "SNG," in the figure, refers to synthetic natural gas made from coal.

[252] EPA, *Inventory of U.S. Greenhouse Gas Emissions And Sinks: 1990 – 2010.* The executive summary to this document is attached as Exhibit 95.

[253] Mark Fulton *et al.*, *Comparing Life-Cycle Greenhouse Gas Emissions from Natural Gas and Coal* (Aug. 25, 2011) ("Worldwatch Report"), attached as Exhibit 96.

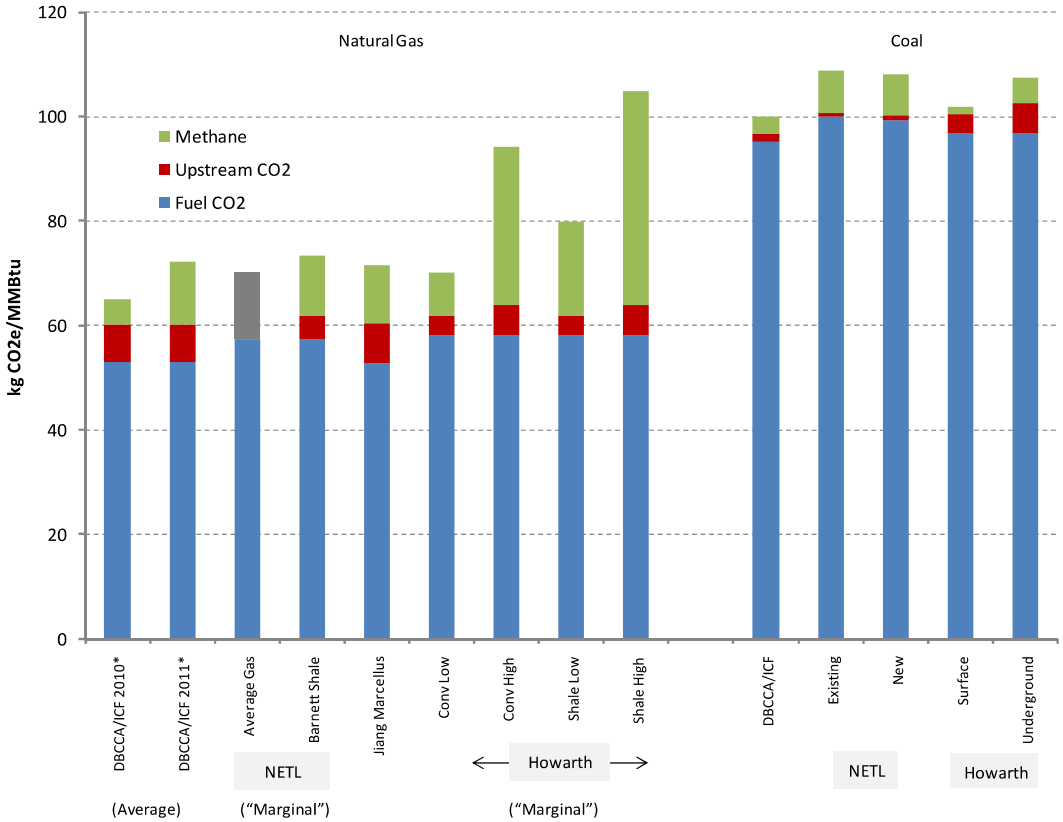
[254] Robert W. Howarth *et al*., *Methane and the greenhouse-gas footprint of natural gas from shale formations*, Climactic Change (Mar. 2011), attached as Exhibit 97.

[255] Mohan Jiang *et al.*, *Life cycle greenhouse gas emissions of Marcellus shale gas*, Environ. Res. Letters 6 (Aug. 2011), attached as Exhibit 98.

[256] 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 99. 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 100.

similar to the NETL estimate.[257] These various assessments are summarized in the following chart.

Figure 3: Comparison of Recent Life-Cycle Assessments[258]



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 CO_2") 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 CO_2e/MMBtu,[259] although, as the above figure shows, some studies estimate that production emissions are significantly higher. Two recent studies 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 CO_2e/MMbtu;[260] and another finding drastically higher emissions.[261]

[257] Worldwatch Report at 9.
[258] *Id.* at 3.
[259] *Id.* at 15 Ex. 8.
[260] JISEA Report (also expressing this figure as 78g CO_2e/kWh).

Jaramillo used production emission estimates that are much lower than those produced by the more recent studies, and using the recent and higher figures appears to erode what little climate advantage Jaramillo found LNG to have over coal. Specifically, Jaramillo used estimates of 15.3 to 20.1 pounds CO_2e/ MMBtu, *i.e.*, estimates that were at least 24 pounds lower than the 2011 studies'.[262] Jaramillo estimated total life-cycle emissions for LNG at 149.6 to 192.3 lbs CO_2e/MMBtu.[263] Simply increasing these life-cycle estimates by 24 lbs CO_2e represents a 12% to 16% increase in total emissions. This increase substantially erodes any climate advantage LNG-fired electricity generation may have over coal-fired generation.

e. In Sum, Golden Pass's Proposal Would Cause or Contribute to Serious Negative Environmental Consequences Which Are Not In the Public Interest

In short, Golden Pass's proposal would exacerbate serious air, water, waste, and land use problems, along with the global climate crisis. None of these consequences are in the public interest, and Golden Pass has offered no evidence to the contrary. DOE/FE must not approve its application for this reason, as well.

E. DOE/FE May Not Conditionally Approve Golden Pass's Proposal Prior to NEPA Review

Neither the economic record nor the environmental record support approving Golden Pass's application. Nonetheless, Golden Pass requests that DOE/FE grant a conditional approval, pending further NEPA review. *See* App. at 40. DOE/Fe must not, and should not, do so.

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.

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

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[261] Jeff Tollefson, Nature, *Methane leaks erode green credentials of natural gas* (Jan. 2. 2013).
[262] Jaramillo Supporting Information at 8.
[263] *Id.*

(emphasis added).[264] 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's recent *Sabine Pass* order does not alter this conclusion. The *Sabine Pass* orders were wrongly decided. Although DOE/FE recently denied our petition for rehearing in that matter, DOE/FE did so without reaching the merits. DOE/FE Order 2961-B. The *Sabine Pass* proceedings illustrate the problem of DOE/FE conditional approval prior to completion of NEPA review. In *Sabine Pass*, DOE/FE expressed its "conditional" view that the project was in the public interest, conditioned on "the satisfactory completion of the environmental review process [by FERC] and on issuance by DOE/FE of a finding of no significant impact or a record of decision pursuant to NEPA." *Sabine Pass* at 41.

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

Second, 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."[265] 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

[264] 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. Alternatively, a conditional order is prohibited by analogous generally applicable regulations promulgated by CEQ, which. As we explain, a conditional order would have these consequences here.

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

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 Golden Pass's export proposal, conditionally or finally, until it has considered the effects of the proposal and the alternatives to it through the NEPA and NGA processes.

F. DOE/FE Cannot Rationally Approve Golden Pass'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 Farm Mut. Auto. Ins. Co.*, 463 U.S. 29, 43 (1983) (emphasis supplied). DOE/FE cannot rationally find for GOLDEN PASS on the record in this case.

As we have demonstrated, record support for Golden Pass's claimed benefits is extraordinarily thin. Golden Pass has submitted economic benefit information derived from input-output modeling, but the underlying model does not show whether the economy would improve *more* without Golden Pass'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 and weakening the domestic economy as a whole.

Further, we have shown that gas extraction and export have major environmental (and, hence, additional economic) costs, which Golden Pass 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).

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

If DOE/FE nonetheless approves Golden Pass'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.[266]

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 Golden Pass 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.

[266] Providing a clear monitoring plan of this sort will also benefit GLLC, 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.

IV. Conclusion

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

Respectfully submitted,

Craig Holt Segall
Sierra Club Environmental Law Program
50 F St NW, Eighth Floor
Washington, DC, 20009

UNITED STATES OF AMERICA
DEPARTMENT OF ENERGY
OFFICE OF FOSSIL ENERGY

IN THE MATTER OF	)	
	)	**FE DOCKET NO. 12-156-LNG**
Golden Pass Products, LLC	)	
	)	

CERTIFIED STATEMENT OF AUTHORIZED REPRESENTATIVE

Pursuant to C.F.R. § 590.103(b), I, Craig Segall, 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 4th day of February, 2013.

Craig Segall
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UNITED STATES OF AMERICA
DEPARTMENT OF ENERGY
OFFICE OF FOSSIL ENERGY

IN THE MATTER OF	)	
	)	**FE DOCKET NO. 12-156-LNG**
Golden Pass Products, 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 February 4, 2013.

Dated at San Francisco, CA, this 4th day of February, 2013.

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UNITED STATES OF AMERICA
DEPARTMENT OF ENERGY
OFFICE OF FOSSIL ENERGY

IN THE MATTER OF	)	
	)	**FE DOCKET NO. 12-156-LNG**
Golden Pass Products, LLC	)	
	)	

VERIFICATION

WASHINGTON	§
	§
DISTRICT OF COLUMBIA	§

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

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Subscribed and sworn to before me this 4th day of February, 2013.

Mary F. Vincent
Notary Public

MARY F. VINCENT
Notary Public, District of Columbia
My Commission Expires March 31, 2013

My commission expires: March 31, 2013