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**UNITED STATES OF AMERICA
DEPARTMENT OF ENERGY
OFFICE OF FOSSIL ENERGY**

IN THE MATTER OF)
)
Jordan Cove Energy Project, L.P.) **FE DOCKET NO. 12-32-LNG**
)

**SIERRA CLUB'S ANSWER TO AMENDMENT TO APPLICATION
AND PROTEST**

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In the above-captioned docket, Jordan Cove Energy Project, L.P. (“Jordan Cove”) requests to modify its pending application for authorization to export natural gas as liquefied natural gas (“LNG”), increasing export volumes from 292 to 350 billion cubic feet per year (“bcf/y”).

Sierra Club protested the initial application, and protests this amendment. As Sierra Club explained, exporting LNG will have severe environmental consequences, both “upstream” of the export facility as a result of the export facility, as exports encourage increased use of natural gas, with infrastructure investments and long-term contracts that threaten to lock in long term use of a dirty fossil fuel with extensive greenhouse gas emissions.

In addition, exports will cause significant economic harm to the majority of Americans, as exports raise gas prices and depress real wages. Studies in the record demonstrate that the primary economic impact of exports will be the transfer of wealth from most Americans to companies involved in gas production and exports, a major distributional impact with relatively miniscule net effect on gross domestic product. Although NERA purports to have addressed the impacts on economic “welfare” of the average American family, and thus this distributional impact, nothing in the NERA reports explains this purported methodology, and the record does not provide a rational basis for the Department to conclude that these distributional impacts will not be negative and severe.

Sierra Club therefore protests this request for amendment, and reiterates Sierra Club’s protest of the initial application, for the reasons we previously stated in Sierra Club’s: initial protest, comments on the EIS prepared by FERC, comments on the NERA study, and comments on DOE’s Environmental Addendum and associated NETL reports. Increasing the

volume of exports, as Jordan Cove proposes to do now, will increase the magnitude of the harms caused by the project.

In addition to incorporating those prior comments by reference, Sierra Club notes that more recent studies and developments have only added to the evidence demonstrating that exports are contrary to the public interest. The Department cannot grant Jordan Cove's application, either as originally filed or with the proposed amendment, without taking a hard look at this additional material.

A. Emissions of Methane and Other Air Pollutants

1. NETL and EIA Reports Provide Tools to Estimate Indirect Emissions

DOE has recognized that its "Addendum to Environmental Review Documents Concerning Exports of Natural Gas from the United States" (August 2014) did "not attempt to identify or characterize the incremental environmental impacts that would result from LNG exports." DOE, Freeport LNG Expansion, L.P., Order 3357-B, Dkt. 11-161-LNG, *Final Opinion and Order Granting Authorization* (Nov. 14, 2014) at 84. However, DOE plainly has the tools to do so; DOE has simply refused to employ them.

As Sierra Club has explained, the EIA's 2012 study on the effect of LNG exports, and the October 2014 update to that study, provide DOE with tools to estimate the extent to which exports will induce additional gas production, and where (on a regional basis, at least) that additional production will occur. Other models, such as those used by Deloitte Marketpoint and ICF International, provide similar capability.

Once DOE has an estimate of the amount of exports-induced gas production, DOE can estimate the amount of air pollution that will be emitted by that production. The National Energy Technology Laboratory reports that DOE released in conjunction with the Addendum estimate volumes of pollutants emitted per unit of gas production. The predictions provided in these reports can easily be expressed in terms of emissions per billion cubic feet of gas production. For example, the "LCA GHG Report," which estimates greenhouse gas emissions, provides estimates in terms of emissions per unit of electricity generated in a hypothetical gas-fired power plant. This estimate is derived from assumptions about the energy content of natural gas and the efficiency of the hypothetical power plant; these assumptions can be factored out to allow the emission rates to be expressed as emissions per unit of natural gas provided using the following:

$$10^9 \text{ scf} \quad * \quad \frac{1,027 \text{ Btu}^{[1]}}{\text{scf}} \quad * \quad \frac{1 \text{ kWh}^{[2]}}{7,351 \text{ Btu}} \quad = \quad 139,700 \text{ MWh}$$

Similarly, NETL’s estimates of emissions of non-GHG pollutants, in grams of pollution per megajoule of gas, can be converted to billions of cubic feet using the following:

$$10^9 \text{ scf} \quad * \quad \frac{1,027 \text{ Btu}}{\text{scf}} \quad * \quad \frac{1,055 \text{ MJ}^{[3]}}{10^6 \text{ Btu}} \quad = \quad 1.08 * 10^9 \text{ MJ}$$

Using these tools, DOE can use information already in the record to estimate the amount of pollution emitted by production that would be induced by Jordan Cove’s proposed exports, and by exports cumulatively.

2. NETL’s Estimated Emission Rates Are Too Low

As we explained in our comments on the DOE environmental materials, these materials underestimate the volume of methane and other pollution emitted by natural gas production. NETL estimates, on the basis of emission factors and component counts, that gas production has a methane leak rate of 1.3 to 1.4%. This is roughly congruent with the estimates EPA provided at the time (i.e., 2014) in EPA’s inventory of greenhouse gas emissions. EPA has recently recognized that that estimate was too low. EPA’s 2016 inventory revises the estimate of greenhouse gases emitted by natural gas extraction, processing, and transportation upward by 27%. *Compare* <http://www3.epa.gov/climatechange/Downloads/ghgemissions/US-GHG-Inventory-2016-Main-Text.pdf> (page 3-68, table 3-43) *with* <http://www3.epa.gov/climatechange/Downloads/ghgemissions/US-GHG-Inventory-2016-Main-Text.pdf> (page 3-70, table 3-45).

These revised numbers are still far below the estimates provided by much of the peer reviewed literature. In the 22 months since the NETL reports were released, numerous additional published peer-reviewed studies have indicated that the actual amount of natural gas emitted during the gas

¹ LCA GHG Report at 18, 22.

² LCA GHG Report at 6, Life Cycle Greenhouse Gas Perspective on Exporting Liquefied Natural Gas from the United States at 30.

³ <http://www.nist.gov/pml/wmd/metric/upload/SP1038.pdf>

lifecycle exceeds NETL's estimate.⁴ DOE must acknowledge this additional science.

Emissions of methane are, roughly, correlated with emissions of other pollutants. For example, EPA has increased its estimate of methane emissions based in part on the conclusion that prior estimated understated the component or activity amounts associated with gas production and processing. Those same components and activities emit other pollutants, such as ozone precursors.

Finally, in addition to underestimating the amount of methane pollution emitted by gas production, processing, and transportation, NETL underestimates the impact of each ton of methane emitted, by using an estimate of methane's global warming potential that ignores climate carbon feedbacks. DOE has since recognized that these feedbacks should be incorporated; DOE should do so here.

3. EPA Has Lowered The Ozone National Ambient Air Quality Standard, Accentuating the Importance of Ozone Precursor Emissions

As NETL recognized, gas production is a significant source of VOC and nitrogen oxides (NO_x), which lead to ozone formation. Numerous areas of the

⁴ Schneising, O, et al. (2014) Remote sensing of fugitive methane emissions from oil and gas production in North American tight geologic formations. *Earth's Future*. [dx.doi.org/10.1002/2014EF000265](https://doi.org/10.1002/2014EF000265), and attached as Exhibit 1. Lavoie et al. (2015). Aircraft-based measurements of point source methane emissions in the Barnett Shale Basin. *ES&T*. [dx.doi.org/10.1021/acs.est.5b00410](https://doi.org/10.1021/acs.est.5b00410), attached as Exhibit 2. Lyon et al. (2015). Constructing a spatially resolved methane emission inventory for the Barnett Shale region. *ES&T*. [dx.doi.org/10.1021/es506359c](https://doi.org/10.1021/es506359c), attached as Exhibit 3. Marchese et al. (2015). Methane emissions from United States natural gas gathering and processing. *ES&T*. [dx.doi.org/10.1021/acs.est.5b02275](https://doi.org/10.1021/acs.est.5b02275), attached as Exhibit 4. McKain et al. (2015). Methane emissions from natural gas infrastructure and use in the urban region of Boston, Massachusetts. *PNAS*. [dx.doi.org/10.1073/pnas.1416261112](https://doi.org/10.1073/pnas.1416261112), attached as Exhibit 5. Zimmerle et al. (2015). Methane emissions from the natural gas transmission and storage system in the United States. *ES&T*. [dx.doi.org/10.1021/acs.est.5b01669](https://doi.org/10.1021/acs.est.5b01669), Exhibit 6.

country with heavy concentrations of drilling are now suffering from serious ozone problems.⁵

On October 1, 2015, EPA lowered the ozone standard from 75 to 70 parts per billion.⁶ Increases in gas production are likely to interfere with states' ability to meet this new standard. For example, the Alamo Area Council of Governments recently concluded that increasing oil and gas production in the Eagle Ford shale would increase 8-hour ozone design values at regional air quality monitors by 0.5 to 0.7 parts per billion.⁷ This report, which was released prior to EPA's new ozone rule, explained that in light of these increases, "If the EPA lowers the 8-hour ozone standard, it will be difficult for the San Antonio-New Braunfels MSA to meet that lower attainment threshold."⁸

B. Federal Policy Recognizing Need For Further Action on Greenhouse Gas Emissions

The President has recognized that achieving the U.S.'s climate goals will require significant action to address the methane emitted by gas production. The Climate Action Plan stated that "[c]urbing emissions of methane is critical to [the nation's] overall effort to address global climate change," and identified "oil and gas development" as one of the "sectors in which methane emissions can be reduced." Climate Action Plan at 10. On January 14, 2015, the President stated a concrete goal for methane reduction: "to cut methane

⁵ See Sierra Club Comment on Environmental Addendum, at 16 – 19.

⁶ U.S. EPA, *National Ambient Air Quality Standards for Ozone*, available at <http://www3.epa.gov/airquality/ozonepollution/pdfs/20151001fr.pdf> and attached as Exhibit 7.

⁷ Alamo Area Council of Governments, *Development of the Extended June 2006 Photochemical Modeling Episode: Technical Report* (October 2013), available at <https://www.aacog.com/DocumentCenter/View/19262> and attached as Exhibit 8.

⁸ *Id.* at v. See also Ahmadi, Mahdi and Kuruvilla John, *An evaluation of the spatio-temporal characteristics of meteorologically-adjusted ozone trends in North Texas*, Air Quality Technical Meeting NCTCOG: Arlington, TX (Apr. 17, 2014) (modeling recent history Barnett Shale gas well contribution to ozone levels in the Dallas/Fort Worth area), available at <http://www.nctcog.org/trans/committees/aqtc/041714/Item.4.pdf> and attached as Exhibit 9.

emissions from the oil and gas sector by 40 – 45 percent from 2012 levels by 2025.”⁹

The President has also recognized that “ultimately, if we’re going to prevent large parts of this Earth from becoming not only inhospitable but uninhabitable in our lifetimes, we’re going to have to keep some fossil fuels in the ground rather than burn them and release more dangerous pollution into the sky.” Statement by the President on the Keystone XL Pipeline (Nov. 6, 2015).¹⁰ The President stated that “America is now a global leader when it comes to taking serious action to fight climate change. And frankly, approving” the Keystone XL pipeline, an infrastructure project that would have linked otherwise isolated fossil fuel supplies with a potential market, “would have undercut that global leadership.” *Id.*

Last December, the President was in Paris negotiating for further international action on climate change. That summit produced a historic agreement establishing the goal of limiting warming to 1.5 degrees Celsius, a target that will require ambitious emission reductions beyond those currently identified. White House, U.S. Leadership and the Historic Paris Agreement to Combat Climate Change (Dec. 12, 2015).¹¹ The agreement requires countries to report their greenhouse gas emissions, and calls on countries to increase the ambition of their reduction targets over time. *Id.*

The Department must address the impacts of additional gas production on these policies and commitments. For example, if exports, cumulatively, cause domestic gas production to increase by 10 percent, this will undoubtedly interfere with the U.S.’s goal of achieving a 40 percent reduction in the total amount of methane emitted from gas production.

C. Deficiencies in FERC EIS

The EIS prepared by FERC failed to adequately consider the above effects.

It also failed to consider alternatives to *DOE* action, despite considering alternatives to FERC action. Under NEPA, the alternatives analysis is “the

⁹ <https://www.whitehouse.gov/the-press-office/2015/01/14/fact-sheet-administration-takes-steps-forward-climate-action-plan-anno-1>, attached as Exhibit 10.

¹⁰ <https://www.whitehouse.gov/the-press-office/2015/11/06/statement-president-keystone-xl-pipeline>

¹¹ <https://www.whitehouse.gov/the-press-office/2015/12/12/us-leadership-and-historic-paris-agreement-combat-climate-change>, attached as Exhibit 11.

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.* Here, alternatives that could lessen the indirect environmental effects include:

1. Whether export from other locations would better serve the public interest by mitigating or better distributing economic or environmental impacts;
2. 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;
3. 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;
4. 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);
5. 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);
6. Whether to permit exports only if the export facilities are designed and operated so as to minimize their environmental impacts;

DOE must consider the cumulative impact of all pending and completed export applications. The public, after all, will not experience each proposed terminal as an individual project: It will experience them cumulatively, through the gas and electricity prices that they will raise and the environmental damage that they will cause. All analysts and observers have

agreed, for example, that higher volumes of exports will cause greater gas price increases. Indeed, several models indicate that prices increase non-linearly with export volumes. That is, going from 4 to 6 bcf/d in exports, for example, may impact domestic prices more than going from 0 to 2 bcf/d.¹²

D. Environmental Impacts of End User Consumption of LNG

As we explain in our incorporated comment regarding DOE's environmental addendum and life cycle analysis, end user combustion of exported LNG will emit extensive greenhouse gases, and these emissions will only partially be offset by displacement other fossil fuel combustion. DOE must consider:

- The fact that NETL underestimates the amount of methane emitted per unit of gas production, as indicated by EPA's own analysis and peer reviewed literature
- The fact that NETL underestimates the global warming impact of each ton of methane emitted, by using a global warming potential other than the one recommended by the IPCC

¹² Robert Brooks, Using GPCM to Model LNG Exports from the US Gulf Coast (2012), available at <http://www.rbac.com/press/LNG%20Exports%20from%20the%20US.pdf>, attached as Exhibit 12. One reason prices may increase this way is that domestic gas consumers differ in their ability to reduce gas consumption. *Id.* at 7. As export volumes increase, increasing numbers of inflexible domestic consumers are forced to compete with exports, further driving up prices. When export volumes are lower, by contrast, price-sensitive domestic consumers can respond to price increases by reducing their consumption, freeing gas supplies for exports and limiting price impacts. The Brooks study, which estimates low price-sensitivity, predicts significantly higher price increases than the EIA Export study. *Id.* at 5, 7. Similarly, in a report by Deloitte MarketPoint that considered multiple export volumes, Deloitte predicted that doubling exports will more than double price impacts thereof. Deloitte MarketPoint, Analysis of Economic Impact of LNG Exports from the United States, at 3, 24, attached as Exhibit 13 (originally filed as Appendix F to Excelerate Liquefaction Solutions I, LLC, Application for Long-Term, Multi-Contract Authorization to Export Liquefied Natural Gas to Non-Free Trade Agreement Countries, DOE/FE Dkt. 12-146-LNG (Oct. 5, 2012)).

- The fact that a significant fraction of gas exported from the US will not be used to “displace” other fossil fuels, but will instead displace renewables or conservation¹³
- The international policy of affording greater weight to emissions a country has regulatory authority over, under the United Nations Framework Convention on Climate Change.
- The fact that, even if U.S. LNG exports produce a short-term global emission benefit as a result of displacement of other fossil fuels (a conclusion Sierra Club strongly disputes), these exports risk entrenching infrastructure that will lock in emission rates for decades, providing a short-term benefit at the expense of hindering the long-term reductions needed to limit warming to 1.5, or even 2, degrees Celsius.

E. Conclusion

Sierra Club therefore reiterates its protest of Jordan Cove’s initial, still-pending application, and protests Jordan Cove’s request to amend that application to increase the volume of proposed exports. Jordan Cove’s proposed exports are contrary to the public interest for the reasons stated above and in Sierra Club’s other filings in this docket. The application must therefore be denied.

Respectfully submitted,



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¹³ See Jurgen Weiss et al., *LNG and Renewable Power Risk and Opportunity in a Changing World* (Jan. 15, 2016), http://www.brattle.com/system/publications/pdfs/000/005/249/original/LNG_and_Renewable_Power_-_Risk_and_Opportunity_in_a_Changing_World.pdf, attached as Ex. 14.

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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 March 23, 2016.

Dated at San Francisco, CA, this 23rd day of March, 2016.



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CERTIFIED STATEMENT OF AUTHORIZED REPRESENTATIVE

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

Dated at San Francisco, CA, this 23rd day of March, 2016.



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VERIFICATION

SAN FRANCISCO §
CALIFORNIA §

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



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Subscribed and sworn to before me this 23rd day of March, 2016.

Notary Public

My commission expires: _____

*see attached "Seurat
Certificate"*

