



Federal Energy Regulatory Commission
 Office of Energy Projects
 Washington, DC 20426

Rio Grande LNG Project
Final Environmental Impact Statement
Volume III, Part 3



Rio Grande LNG, LLC and Rio Bravo Pipeline Company, LLC

April 2019
Docket Nos. CP16-454-000, CP16-455-000
FERC/EIS-0287F

Cooperating Agencies:



U.S. Environmental Protection Agency



U.S. Department of Transportation



U.S. Coast Guard



U.S. Department of Energy



U.S. Army Corps of Engineers



U.S. Fish and Wildlife Service



Federal Aviation Administration



National Park Service



National Oceanic Atmospheric Administration -
 National Marine Fisheries Service

CO (Companies and Organizations)

CO1 - South Padre Island Chamber of Commerce

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November 9, 2018

ORIGINAL

Kimberly Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, NE Room 1A
Washington, DC 20426

FILED
SECRETARY OF THE
COMMISSION
2018 NOV 21 A 9 25
REGULATORY COMMISSION

Re: FERC Dockets CP16-454-000 and CP16-455-000

Dear Secretary Bose and FERC Commissioners,

In response to the NOTICE OF AVAILABILITY OF THE DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR THE RIO GRANDE LNG PROJECT dated October 12, 2018, this letter serves as a demonstration of our continued support for the construction of the Rio Grande LNG facility on Texas State Highway 48, in Cameron County, adjacent to the Brownsville Ship Channel and for construction of the associated Rio Bravo Pipeline.

CO1-1

We are pleased the permitting process continues to advance. We are confident in the permitting process, and the results to date clearly support permit issuance. Rio Grande LNG has responded promptly and effectively to all public questions and concerns. Naysayers will continue to throw down every conceivable roadblock with no consideration or respect for the process and all parties involved. We place great confidence in the FERC and TCEQ standards and process. We want this project.

The economic impact of this project will be significant for our region. Already Rio Grande LNG leadership has become actively involved in our community. They have gone to great lengths to communicate with everyone in our area, providing project updates and information. In our many meetings with representatives from RG LNG, we have been impressed by their commitment to high standards of operations.

CO1-2

Our support for the project started over two years ago and remains today. We are pleased the project is advancing.

Sincere regards,

Roxanne M. Ray
Roxanne M. Ray
President/CEO

CO1-1 Comment noted.

CO1-2 Comment noted.

CO (Companies and Organizations)

CO2 - Brownsville Navigation District

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November 30, 2018

Chairman Neil Chatterjee
Federal Energy Regulatory Commission
888 First Street NE
Washington, DC 20426

RE: Rio Grande LNG and Rio Bravo Pipeline
Docket Nos. CP16-454-000 and CP16-455-000

Dear Chairman Chatterjee:

Please accept this letter on behalf of the Port of Brownsville expressing our continued support for the Rio Grande LNG Project and the associated Rio Bravo Pipeline Project. These projects will create thousands of job opportunities for the people of the Rio Grande Valley. We have worked closely with Houston-based Next Decade Corporation to advance its plans to develop these important infrastructure projects at and near our port.

CO2-1

The Port of Brownsville is the only deep-water seaport located directly on the U.S./Mexico border. We are a large land-owning public port authority with approximately 40,000 acres of land. Next Decade's plans to construct and operate a natural gas liquefaction and export facility will help the nation mitigate trade deficits with key allies and improve the global environment through the provision of clean-burning, U.S. produced natural gas. The Rio Grande LNG and the Rio Bravo Pipeline projects are expected to contribute more than \$35 billion to the U.S. GDP during construction, and more than \$500 million annually during operations. These projects will help further our nation's energy independence, which is a key priority of our current administration, the Congress and policymakers throughout Texas.

CO2-2

We very much appreciate the FERC's staff efforts to review these projects, resulting in the October 18, 2018 issuance of the draft environmental impact statement. We understand this work is carried out in accordance with the National Environmental Protection Act, and it is very rigorous, time-consuming and resource intensive.

CO2-3

We look forward to the timely issuance of a final environmental impact statement and to your final approval of the projects as soon as possible. We are confident that in the coming months, Next Decade will accomplish its commercial and engineering milestones and that final approval of these projects will create tremendous opportunities for the Port of Brownsville. These projects will provide significant economic benefits our region and for the entire State of Texas that will be felt for generations.

CO2-4

Sincerely,


Eduardo A. Campirano
Port Director & CEO
Port of Brownsville

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CO2-1 Comment noted.

CO2-2 Comment noted.

CO2-3 Comment noted.

CO2-4 Comment noted.

CO (Companies and Organizations)

CO3 - Friends of the Wildlife Corridor

20181203-5212 FERC PDF (Unofficial) 12/3/2018 3:02:21 PM

Friends of the Wildlife Corridor, Alamo, TX.

2018
Kimberly D. Bose
Secretary, Federal Energy Regulatory Commission
888 First Street NE, Room 1A
Washington, D.C. 20426

Comments on Draft Environmental Impact Statement
Rio Grande LNG CP16-454-000
Rio Bravo Pipeline CP16-455-000

Dear Secretary Bose,

The Friends of the Wildlife Corridor is a non-profit 501c(3) conservation organization which supports Santa Ana and Lower Rio Grande Valley National Wildlife Refuges and is committed to the protection of native and migratory wildlife species and the greatly-diminished habitat that they depend on. The proposed Projects would further diminish that habitat and impact our wildlife. Here are our comments.

1. The Draft EIS is incomplete. There is a long list of important information that FERC is requesting from Rio Grande LNG "before the end of the comment period" which is today. That information should have been included in the DEIS; otherwise how is the public supposed to review and comment on it? Once that missing information is submitted and made available to the public the comment period should be re-opened or extended for at least an additional 2 weeks.

CO3-1

2. The Draft EIS is not available in Spanish. The Rio Grande Valley is 85-90% Hispanic, including many first-generation families for whom Spanish is the primary language. They are being excluded from this public process.

CO3-2

3. All endangered species consultations with USFWS and NMS should be completed before FERC issues its Record of Decision, not "before construction." ESA mitigation requirements (or a jeopardy determination) may affect FERC's final conclusions and recommendations.

CO3-3

4. There is no mitigation proposed for the upland loma and other brush habitat (74 acres) that will be cleared. The DEIS describes this as a "moderate" permanent impact on local wildlife. We find the lack of any mitigation for this loss unacceptable. Even more unacceptable is the proposed mitigation for the more extensive wetland losses. The Applicant proposes to "preserve" an already-existing and functioning wetland that is under the protection of the USFWS. This is not meaningful mitigation and violates the federal No Net Loss policy.

CO3-4

5. The DEIS says that of the 3655 acres that would be "disturbed" during construction, 1507 acres "would return to pre-construction conditions & uses", including wetlands. After literally years of heavy construction activity this is highly unlikely, particularly in the terminal area. FERC should require wetland and uplands mitigation for these losses in habitat value and function. Similarly, using wetlands for "workspace" and roads is unacceptable. The likelihood of these areas

CO3-5

CO3-1

The EIS was prepared in accordance with NEPA, Council on Environmental Quality (CEQ) guidelines, and the Commission's regulations and policy. The EIS is consistent with FERC style, formatting, and policy regarding NEPA evaluation of alternatives and different impact types. The EIS is comprehensive and thorough in its identification and evaluation of feasible mitigation measures to reduce those effects whenever possible. While some information was still pending at the time of issuance of the draft EIS, the lack of this final information does not deprive the public of a meaningful opportunity to comment on a substantial adverse environmental effect of the Project or a feasible way to mitigate or avoid such effect. The draft EIS included sufficient detail to enable the reader to understand and consider the issues raised by the proposed Project and addresses a reasonable range of alternatives. The FERC continued to accept comments on the draft EIS and other related materials placed into the record past the end date of the comment period up, to the extent possible, until the point of publication of the final EIS. The final EIS includes additional information provided by RG Developers, cooperating agencies, and new or revised information based on substantive comments on the draft EIS.

CO3-2

We received two comments during the scoping period requesting that Project materials be translated into Spanish. Executive Order No. 12898, which informs the federal government's approach to issues of environmental justice, is not binding on the Commission.

However, it is current Commission practice to address environmental justice in its NEPA documents when raised as an issue or otherwise warranted. Therefore, we have included this discussion in the final EIS in section 4.9.10. Further, in an effort to include Spanish language speakers in the NEPA process, Spanish language Project materials were made available to the public during the scoping meeting and public comment meeting held in Port Isabel as described in section 1.3.1 of the final EIS. In addition, a translator was available to assist Spanish language speakers. During the public scoping meeting, very few of the Spanish language materials that were made available were utilized by attendees. As such, we determined that translation of the draft EIS into Spanish was not necessary.

CO3-3

The EIS was prepared in accordance with NEPA, CEQ guidelines and other applicable requirements. In addition to conducting its own independent analysis of the Project, the FERC also relies on the expertise of federal, state, and local agencies who have regulatory authority and oversight of the laws, rules, and regulations described in the EIS. The outreach and agency engagement conducted for the Project is described in section 1 of the EIS. An applicant must also demonstrate that it has conducted surveys in accordance with a regulatory agency's protocols and/or the law, and consulted with the appropriate agency personnel and applied for applicable permits. If the Project is authorized, the FERC Order will include conditions that must be met in advance of any construction. If the conditions cannot be met, construction cannot move forward, even if the Project was authorized. Once such condition includes finalization of ESA consultation with the FWS and the National Marine Fisheries Service (NMFS), which will identify any additional mitigation that must be met. If either agency issues a jeopardy determination, FERC could adopt a reasonable or prudent alternative, refuse to authorize the commencement of construction, or request an exemption from the Endangered Species Committee. Given these regulatory mechanisms, FERC finds that recommending these consultations to be finalized prior to construction is adequate.

CO (Companies and Organizations)

CO3 - Friends of the Wildlife Corridor

CO3-4 Lomas are not protected habitat and do not require mitigation; any mitigation for habitat loss for the ocelot (which may include lomas) would be determined through completion of the ESA consultation process. As described in section 4.4.2 of the EIS, wetland mitigation plans are part of the permitting process associated with Section 404 of the CWA. RG LNG's final wetland mitigation plans would be developed and submitted to the COE, and would be implemented in addition to the construction mitigation measures outlined in RG LNG's Procedures and the measures described in the EIS. Construction of the LNG Terminal would not commence prior to finalization of the wetland mitigation plans and issuance of the COE's CWA Section 404/Section 10 permit.

CO3-5 In section 4.4.2.2 of the EIS, we acknowledge that, due to the longer disturbance of wetlands within the same corridor due to proposed sequential installation of Pipelines 1 and 2, and the potential for conversion of wetland cover types within the permanent right-of-way, compensatory mitigation could be required as part of the CWA Section 404 permit for the Pipeline System. Issuance of the CWA Section 404 permit is not under FERC's jurisdiction. Regarding the restoration of wetlands disturbed during construction, section 6.3 of RG Developers' Procedures describes wetland restoration requirements, which includes, but is not limited to, consultation with appropriate federal or state agencies to develop a Project-specific wetland restoration plan, and ensuring that all disturbed areas successfully revegetate with wetland herbaceous and/or woody plant species and control the invasion and spread of invasive species and noxious weeds. Section 6.4.5 of RG Developers' Procedures describes the criteria for determining successful wetland restorations. The COE may require additional monitoring parameters during its permitting process. Similarly, section 7.1 of RG Developers' Plan revegetation of uplands would not be considered complete until, upon visual survey, the density and cover of non-nuisance vegetation is similar to that of adjacent, undisturbed lands. Although no mitigation is typically required for general habitat, any mitigation for habitat loss for the ocelot or northern aplomado falcon would be determined through completion of the ESA consultation process.

CO (Companies and Organizations)

CO3 - Friends of the Wildlife Corridor

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returning to their original state and function after several years of heavy construction is almost nil.

6. The DEIS states that the wetlands, the BSC, and mudflats at the terminal site are essential fish habitat (EFH). Yet it appears that no study has been done of the fish, shellfish, crustacean & other benthic resources in the Channel at the Project site. Without that baseline data how can FERC assess the impacts of the extensive dredging, pile-driving and operation of the Project? Impacts assessment would be speculative at best. Also missing are assessments of possible impacts to the Bahia Grande and South Bay. Shallow-bay sea grasses are particularly sensitive to dredge-spoil deposition and associated turbidity.

7. The Living Wildlife Report found in its latest Living Planet Index that wildlife populations have declined 60% in the last 40 years world-wide. As the Rio Grande Valley has already lost 95-98% (91% in Cameron County) of its native landscape to urban, agricultural and industrial uses, the remaining native habitat is even more critically important. There are at least 24 animal species in the Project area that are federally or state-listed as endangered, threatened or rare. The DEIS states that Rio Grande LNG will likely adversely affect the endangered Northern Aplomado falcon, the threatened Piping Plover and its critical habitat, and the endangered ocelot. The Project's likely impacts to habitat and wildlife are not acceptable, as it will continue the trend of fragmenting and destroying some of our last remaining ecosystems, including the connectivity of the Bahia Grande Coastal Corridor.

8. The Project's consultations with FWS with regards to the Migratory Bird Conservation Plan should be finalized and included in the EIS for public review and comment. Requiring this information only "before construction" (hence after possible permitting) is not acceptable.

9. Noise and light pollution will result in an environment that wildlife (particularly migratory birds and nocturnal species including the ocelot) will likely avoid at the Wildlife Corridor and 437 acres within the Laguna Atascosa NWR. Sound and light are permanent physical changes to the landscape and preventing their extension beyond the terminal boundaries is a near-impossible task. Particularly vulnerable are the surrounding wetlands, vegetated uplands and the adjacent Laguna Atascosa NWR.

10. For a Project with so many significant environmental impacts, no need for the Project has been shown. There are 12 to 16 LNG liquefaction export terminals likely to come on-line before Rio Grande LNG, and there are as-yet no buyers, no binding contracts for the LNG that Rio Grande proposes to produce.

11. The DEIS appears to lack any analysis of possible impacts to both the bait shrimping industry (which fishes the BSC) and the off-shore shrimping industry which relies on ready access to the BSC to get to & from the Gulf. That analysis needs to be included.

12. The DEIS states there would be "moderate impacts on the Zapata Boat Launch" area, which is heavily fished by locals. There would be even greater impacts to fishing (and birding) at the Restoration Channel, which nearly abuts the Project site. The Restoration Channel connects the BSC to the Bahia Grande.

13. The DEIS says "neither construction nor operation would be expected to significantly impact tourism..." There is no data to support this statement. Port Isabel, South Padre Island and Laguna Atascosa NWR are all very beach & nature tourism-dependent. Interview-type studies need

CO3-5

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CO3-6

Appendix M includes a revised essential fish habitat (EFH) assessment for the Project, which includes an assessment of habitats and managed species with the potential to occur at the Project site based on available data and field survey results for habitats in the Project area. Consultation regarding the EFH assessment is complete, and, given the temporary, minor impacts on EFH, NMFS does not have EFH conservation recommendations for the Project. Section 4.3.2.2 of the EIS describes dredging impacts on water quality, including the potential for sediment to reach the Bahia Grande. Section 4.6.2 of the EIS states that South Bay connects to the BSC more than 2.5 miles from the LNG Terminal site; therefore, impacts of dredging and dredged materials on seagrass beds and oyster beds within South Bay are not anticipated.

CO3-7

Impacts on wildlife and threatened and endangered species are discussed in sections 4.6.1 and 4.7, respectively. Although the land associated with the LNG Terminal is intended to be developed for heavy industrial use in accordance with the BND's long-term plan (see section 4.8.1.2), RG LNG would maintain wetland areas on the west and east of the site and, in accordance with federal requirements mitigate for the loss of on-site wetlands. RG LNG would also be required to comply with federal requirements for mitigation and consultations under the ESA. In accordance with FWS comments on the draft EIS, and additional coordination, we have revised our determinations for the northern aplomado falcon, piping plover, and jaguarundi (see section 4.7.1). As stated in section 4.7.1.4, the Coastal Corridor Project would not be crossed by the Project.

CO3-8

Although our recommendation in section 4.6.1.3 would allow for the MBCP to be finalized after a decision on the Project has been made, a draft of the plan was filed on the FERC docket for public review and comment (see accession number 20161229-5149). The FWS has responsibility and purview over the Migratory Bird Treaty Act, and the FWS and TPWD have provided comments on the plan; therefore, we recommend that the plan be finalized in consultation with those agencies. The final MBCP will also be publicly filed with the FERC, when available, and construction of the Project, if approved, could not proceed without FERC's issuance of a Notice to Proceed.

CO3-9

Noise and light would result in indirect impacts on adjacent wildlife. RG Developers have proposed lighting mitigation to minimize impacts on area wildlife; however, we have added a recommendation to section 4.6.1.2 for RG Developers to further consult with the FWS and TPWD regarding additional measures that could be implemented to further minimize the impacts of lighting. Further, indirect impacts of noise and lighting on potential ocelot habitat within the Laguna Atascosa NWR are included in the impact assessment that led to our determination of "likely to adversely affect" for the federally listed ocelot, which requires the FWS to develop a Biological Opinion on the impacts of a given project on a species (see section 4.7.1.4).

CO (Companies and Organizations)

CO3 - Friends of the Wildlife Corridor

CO3-10	<p>Under Section 3 of the Natural Gas Act (NGA), oversight for LNG export is divided between the Commission and the U.S. Department of Energy (DOE). FERC is responsible for approving the safe and sound siting and operation of LNG facilities, given that DOE has approved the export of the commodity. It is the DOE, not the Commission, which retains the exclusive authority over the export of the natural gas as a commodity, including the responsibility to consider whether the exportation of that gas is consistent with the public interest. As described in section 1.1 of the EIS, the DOE granted an authorization to RG LNG for export to countries having a free trade agreement (FTA) with the United States that includes national treatment for trade in natural gas. In accordance with the NGA and Energy Policy Act of 1992, export to a country with which there is an FTA requiring national treatment for trade in natural gas, is deemed consistent with the public interest. Further, RB Pipeline executed a precedent agreement for the total capacity of the Rio Bravo Pipeline for the 20-year life of the Project, which establishes a basis for a finding by the Commission that the pipeline will be in the public convenience and necessity under Section 7.</p>
CO3-11	<p>Sections 4.9.4 and 4.9.8.2 have been revised to more explicitly address impacts on the bait shrimping industry.</p>
CO3-12	<p>Potential impacts on tourism, including bird watching, and recreational fishing, including fishing within the Bahia Grande Channel, are addressed in section 4.9.3.</p>
CO3-13	<p>The EIS recognizes the Project's impacts on eco-tourism in section 4.9.3 including an increase in noise, changes in the visual landscape, and heavier traffic along SH-48.</p> <p>Recreation and special use areas, including birding trails, that are in proximity to the Project are also addressed in section 4.8.1.5, while impacts on visual receptors at recreation and special use areas are addressed in section 4.8.2.</p> <p>We find that impacts on tourism, including nature-based and eco-tourism, would generally be greatest during construction of the Project. Following construction, the LNG Terminal would be the primary source of permanent impacts on tourism as the pipelines would be buried and the associated aboveground facilities would be in remote areas, offering limited visibility and mitigating noise impacts. To mitigate impacts on visual receptors and operational noise from the LNG Terminal, RG LNG would use of ground flares, grey tank coloring, horticultural plantings, and the construction of a levee that would obstruct most construction activities and low-to-ground operational facilities from view. We find that no visual or noise impacts on South Padre Island beaches and associated tourism would occur, given that the beaches face the ocean and are 5 miles away. However, we do recognize impacts on recreational fishing boats for trips that begin from Port Isabel or South Padre Island, in the form of delays at Brazos Santiago Pass if they arrive during LNG carrier transit. As further described in section 4.9.3.1, most current nature tourism facilities at the Laguna Atascosa NWR, including Boca Chica Beach, are far enough away from the LNG Terminal site that they would not be impacted by construction; however, we have updated section 4.9.3.1 to discuss planned facilities within the Bahia Grande unit of the Laguna Atascosa NWR.</p>

CO (Companies and Organizations)

CO3 - Friends of the Wildlife Corridor

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to be done with out-of-area visitors to meaningfully assess this impact. Heavy petrochemical industrialization drives away nature tourism.

14. Rio Grande LNG must complete its cultural resources survey and complete necessary consultations before the EIS is finalized, not "prior to construction." Otherwise the public is being left out entirely.

15. If Rio Grande LNG is built it would be by far the single largest stationary source of nitrogen oxides, carbon monoxide, VOS's, sulfur dioxide, particulate matter and greenhouse gases in the Rio Grande Valley. Nevertheless, the DEIS states "...Project emissions are below applicable screening levels, and therefore adverse health effects are not expected." We disagree. The higher the air pollutant levels the more adverse health effects there are, especially to vulnerable populations. In April & May every year there are days when the RGV has some of the highest particulate levels in the state (TCEQ air monitoring data). The emissions from this project would worsen those levels. Cumulatively, the DEIS concludes that the 3 LNG projects "would contribute significantly to air quality impacts, potentially exceed NAAQS in local areas, and result in cumulatively greater air quality impacts. This is not acceptable and is grounds for denial of this permit.

16. In considering all 3 LNG projects the DEIS says "the greatest cumulative impacts" would be on soils, surface water quality, vegetation, wildlife, aquatic resources, threatened and endangered species, visual resources, land & water-based transportation, air quality and noise. It further states "We conclude that cumulative impacts of the 3 LNG terminals on visual resources would be significant" and that Rio Grande LNG "combined with the other projects in the geographic scope, including the Texas LNG and Annova LNG projects, would result in "significant cumulative impacts..." Such significant impacts are not acceptable.

17. The cumulative emissions of greenhouse gases from all 3 LNG projects would be massive (10.7 million tons per year), with Rio Grande LNG being by far the largest contributor (8.7 million tons). And this would continue for 20-30 years or longer, when we need to be reducing carbon emissions drastically much sooner to prevent a global warming "worst case scenario." That the Project emissions' effect on global warming cannot be precisely determined is no reason for FERC to wash its hands of it. FERC should require carbon capture technology, or else deny the permit.

18. The construction and placement of a 138kV overhead powerline along SH48 is entirely dependent upon FERC's decision to approve Rio Grande LNG's permit application. This powerline would cause significant visual and wildlife impacts, particularly to birds, including threatened and endangered species. These impacts need to be evaluated by the Applicant and be part of the EIS for public review.

In summary, the Friends of the Wildlife Corridor urges FERC to deny this permit. The environmental impacts are too many, too significant, and too far-reaching. The damage to wildlife, wildlife habitat, air quality, wetlands, quietude, and night sky are too great to be accepted or mitigated.

Thank you for this opportunity to comment.

Jim Chapman, Vice President
Friends of the Wildlife Corridor

CO3-13

CO3-14

CO3-15

CO3-16

CO3-17

CO3-18

CO3-14

While some information is pending, sufficient information has been provided to enable the reader to understand and consider the issues, and afford the public a meaningful opportunity to comment. The Section 106 process to identify, evaluate, assess, and mitigate adverse effects on historic properties is ongoing, and would be completed prior to construction of the Project, if authorized. Completion of the Section 106 process would include completion of field surveys, which may not be possible prior to issuance of a FERC Certificate due to restricted access to construction workspaces.

CO3-15

Comment noted. As described in section 4.11.1 of the EIS, the State of Texas requires a State Health Effects air quality analysis. The results of RG LNG's State Health Effects modeling evaluation indicate that the Project emissions are below applicable effects screening levels, and therefore adverse health effects are not expected. The final EIS was revised to identify the pollutants assessed, which include benzene (a volatile organic compound [VOC]). The Texas Commission on Environmental Quality (TCEQ) is the agency responsible for the review of the State Health Effects analysis, and on December 17, 2018, the TCEQ issued an order granting air quality permits to RG LNG. Further, potential pollution emissions from the LNG Terminal site, when considered with background concentrations, would be below the NAAQS, which include standards for particulate matter (PM), and, which are designated to protect public health including sensitive populations such as children, the elderly, and asthmatics.

CO3-16

Comment noted.

CO3-17

Section 4.13.2.9 of the final EIS was revised to acknowledge that the Project greenhouse gases (GHG) emissions would incrementally contribute to climate change. Mitigation and emission reductions are more appropriately handled by the federal and state agencies, in this case the EPA and TCEQ, with the authority to impose such reductions to meet federal and state air quality goals. RG Developers have committed to complying with the GHG Best Available Control Technology (BACT) requirements included in their Prevention of Significant Deterioration (PSD) permit for the LNG Terminal and Compressor Station (see section 4.11.1.3 of the EIS).

CO3-18

Impacts associated with the non-jurisdictional electric transmission line are discussed in section 1.4 (location and land requirements) and section 4.13 (contribution to cumulative impacts). FERC does not have siting or design authority over the non-jurisdictional electric transmission line and does not have the authority to require the entity that constructs, owns, and operates it to implement certain voluntary best management practices.

CO (Companies and Organizations)

CO4 - American Petroleum Institute



December 3, 2018

Chairman Neil Chatterjee
Federal Energy Regulatory Commission
888 First Street NE
Washington, D.C. 20426

**Re: Rio Grande LNG and Rio Bravo Pipeline
Docket Nos. CP16-454-000 and CP16-455-000**

Dear Chairman Chatterjee,

On behalf of the American Petroleum Institute (API), I write in support of the draft Environmental Impact Statement (DEIS) for the Rio Grande LNG and Rio Bravo Pipeline projects (herein, the "Project"). The Project involves Rio Grande LNG, a large-scale LNG export project to be constructed in the Port of Brownsville in South Texas, as well as the Rio Bravo Pipeline, a twin 42-inch pipeline that will transport gas from the Agua Dulce area to Rio Grande LNG. The Project is being proposed by NextDecade Corporation, which is headquartered in Houston and focused on LNG project development, and associated pipelines, in Texas.

CO4-1

The economic and environmental benefits of exporting U.S. LNG, including those to be gained by the approval of the Rio Grande LNG Project, are significant. Further, the DEIS for the Project is appropriately tailored to recognize these benefits at what is a critical time for the U.S. natural gas industry. As such, API encourages the Federal Energy Regulatory Commission (FERC) to proceed with the timely issuance of the final EIS for this important Project.

CO4-2

CO4-3

I. Statement of Interest

API is a national trade association that represents over 625 companies involved in all aspects of the oil and natural gas industry. API's members include owners and operators of LNG import and export facilities in the United States and around the world, as well as owners and operators of LNG vessels, global LNG traders, and manufacturers of essential technology and equipment used all along the LNG value chain. Our members also have extensive experience with the drilling and completion techniques used in shale gas development and in producing America's natural gas resources in a safe and environmentally responsible manner.

II. Benefits of Increased U.S. LNG Exports

Since 2007, U.S. natural gas production has increased dramatically, and the U.S. recently became a net exporter of natural gas for the first time in several decades. A growing portion of these exports are in the form of LNG and the U.S. is now on its way to becoming one of the world's largest LNG exporters. Increasing LNG exports have already produced considerable domestic benefits for the

CO4-4

CO4-1 Comment noted.

CO4-2 Comment noted.

CO4-3 Comment noted.

CO4-4 Comment noted.

CO (Companies and Organizations)

CO4 - American Petroleum Institute

<p>United States, including jobs created by the construction and operation of the facilities themselves. These benefits are poised to increase further as additional U.S. LNG export projects, such as Rio Grande LNG, are sanctioned.</p>	CO4-4
<p>The local benefits of U.S. LNG development are particularly robust. For instance, over its multi-year construction timeline, the Rio Grande LNG and Rio Bravo Pipeline will bring thousands of jobs to communities in the Rio Grande Valley and throughout the State of Texas. The economic boost will extend across the energy value chain by providing producers in west Texas a long-term market for nearly 4.5 BCFD of associated natural gas production, thereby providing a superior alternative to flaring. Completion of the Rio Grande project would also increase state and local government revenues.</p>	CO4-5
<p>The continued safe and environmentally responsible development of domestic natural gas is an increasingly important component of America’s energy security and economic strength. In addition to the domestic economic benefits of U.S. LNG exports, natural gas—the cleanest burning fossil fuel—can play a critical role in advancing environmental goals both at home and abroad. Already, the increased use of natural gas for electricity generation in the U.S. has lowered U.S. emissions to levels not seen in 25 years. With global emissions on the rise, increased use of U.S. natural gas around the world—supplied by projects such as Rio Grande LNG—could help make the world’s air cleaner. Many countries rightly view natural gas as a critical fuel for the future and understand it will play an outsized role in making their energy systems cleaner, more reliable and more efficient. It will also improve the United States’ balance of trade with a number of importing nations and deepen relationships with many of our most important allies. There is thus considerable upside in facilitating greater access to our abundant natural gas resources and building stronger linkages between U.S. producers and global LNG markets.</p>	CO4-6
<p>API is far from alone in recognizing the considerable benefits of increased U.S. LNG exports. Indeed, over the last several years, a multitude of studies have shown a consistently positive relationship between rising LNG exports and domestic economic benefits. For example, in June 2018, the U.S. Department of Energy (DOE) completed its fifth and most comprehensive study of U.S. LNG exports, “Macroeconomic Outcomes of Market Determined Levels of U.S. LNG Exports” (herein referred to as the “2018 LNG Export Study”). As in the previous four studies, the 2018 LNG Export Study found that U.S. LNG exports provide a net benefit to American consumers and workers. Further, the study once again found that U.S. natural gas supply is abundant and more than sufficient to sustain substantial increases in both domestic consumption and exports going forward.</p>	CO4-8
<p>Therefore, API believes U.S. LNG clearly offers sizeable benefits to the U.S. economy, environment and beyond. As such, we strongly support the Rio Grande LNG and Rio Bravo pipeline projects and encourage FERC to proceed with the timely issuance of the final EIS.</p>	CO4-9
<p>III. Timeline of NEPA Review</p>	
<p>According to the Rio Grande LNG and Rio Bravo pipeline dockets, FERC has issued a scheduling notice that calls for the publication of the final EIS for the Project on April 26, 2019. API encourages FERC to proceed expeditiously in completing this critical effort.</p>	CO4-10

CO4-5	Comment noted.
CO4-6	Comment noted.
CO4-7	Comment noted.
CO4-8	Comment noted.
CO4-9	Comment noted.
CO4-10	Comment noted.

API understands and appreciates the considerable complexity involved in completing a thorough review of this and other LNG export projects. Yet, there are clear negative consequences associated with any unnecessary delays in their review and permitting, which would put U.S. projects at a competitive disadvantage to alternative LNG supply regions—all of which are attempting to outpace the U.S. in supplying the rapidly expanding LNG market.

CO4-10

That being the case, API welcomes the dedicated recent efforts on behalf of FERC Commissioners and staff to ensure these NEPA reviews are completed in a thorough but timely manner. These efforts include increased cooperation with the Pipeline & Hazardous Materials Safety Administration (PHMSA) on project reviews, as well as the use of outside, third-party support to assist in construction inspections and other components of the project review process. API strongly supports these efforts.

IV. Conclusion

API applauds FERC for recognizing the importance of these critical projects and understanding that unnecessary delays in the permitting process would put the United States at risk of missing out on the important economic, environmental and foreign policy gains associated with market-determined levels of U.S. LNG exports.

This outcome would be deeply unfortunate and would mark a serious missed opportunity. As such, API thanks FERC for its dedication and close attention to this important application.

Respectfully submitted,

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cc: Commissioner Cheryl LaFleur
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December 3, 2018

Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First St., NE, Room 1A
Washington, DC 20426
Via FERC eFiling

Re: Motion to Intervene in the Matter of FERC Docket Nos. CP16-454-000 and CP16-455-000

A. SaveRGVfromLNG Should Be Granted Intervention

In Docket CP16-454, Rio Grande LNG, LLC seeks authorizations under Section 3(a) of the Natural Gas Act to site, construct, and operate a new liquefied natural gas export and truck loading terminal near Brownsville, Texas. In Docket CP16-455, Rio Bravo Pipeline Company, LLC proposes to site, construct, and operate infrastructure necessary to deliver natural gas feedstock to this export facility, including two pipelines, related compressor stations, and other facilities.

FERC regulations permit intervention upon a showing that “the movant has or represents an interest which may be directly affected by the outcome of the proceeding” or that “the movant’s intervention is in the public interest.” FERC Rule 214, 18 C.F.R. 385.214(b)(2). These low hurdles rightly reflect FERC’s Natural Gas Act responsibility to determine the public interest on matters which have significant implications for the country. SaveRGVfromLNG satisfies both of these alternative standards for intervention.

SaveRGVfromLNG and its members have interests that will be affected by these proceedings. These projects will directly affect SaveRGVfromLNG members. Some of its members have individually intervened in the docket¹ and almost all of its members live in the Rio Grande Valley region where the project will be sited.

SaveRGVfromLNG is based in Cameron County, Texas, where the Rio Grande LNG Project will be located. These members will be affected by, among other things:

¹ These include, but are not limited to, William Berg; Jim Chapman; Joyce M. Hamilton; John Young.

CO (Companies and Organizations)

CO5 - Irvine & Conner PLLC

- Impacts on wildlife in the region, including endangered ocelots, jaguarundi, and other species; CO5-1
- The air pollution emitted by the facilities, including but not limited to greenhouse gases and production of ozone in the region; CO5-2
- Impacts on the ability to use waters near the project for fishing, recreation, and other purposes; CO5-3
- Noise and light from the project; CO5-4
- Economic impacts to tourism from the project; CO5-5
- The risk of fire, explosion, or other accident at the project site; CO5-6
- The loss of local wetlands in or around the project site; CO5-7
- The environmental impacts of additional gas production induced by the project and related exports. CO5-8

SaveRGVfromLNG and its members have articulated many of its concerns in this docket as of the date of this filing and has a continued interest in participating in the proceeding and raising issues of fact and law related to Rio Grande LNG’s application and associated environmental documents.

The interests that SaveRGVfromLNG represents here, including environmental, aesthetic, and economic interests, are shared by the public at large, such that the group’s intervention is in the public interest as provided by 18 C.F.R. 385.314(b)(2)(iii). The group was formed to comment on and oppose the development of LNG facilities in the Rio Grande Valley region, to organize with the community regarding LNG development and associated impacts in the region, and to engage in efforts to protect public health, the environment, and local tourism from impacts related to LNG facilities.

B. Information Regarding SaveRGVfromLNG

Pursuant to 18 CFR 385.203(b)(1)-(2), SaveRGVfromLNG states that the name of the movant is “SaveRGVfromLNG.”² The location of the group’s principal place of business is 48 Golf House Rd., Laguna Vista, TX 78578.

SaveRGVfromLNG identifies the following persons for service of correspondence and communications regarding this application:

² The organization’s name is sometimes styled as “Save RGV from LNG,” and comments or other participation from that stylization should also be treated as comments or participation by “SaveRGVfromLNG,” but the organization’s official name does not include spaces.

- CO5-1 Impacts on wildlife and threatened and endangered species are discussed in sections 4.6.1 and 4.7, respectively.
- CO5-2 GHG emissions and regional ozone (O₃) impacts of the LNG Terminal are quantified in section 4.11.1.3 of the EIS.
- CO5-3 Potential impacts on recreation and tourism, including fishing, are addressed in sections 4.8.1.5 and 4.9.3, respectively.
- CO5-4 Noise from the Project is addressed in section 4.11.2 of the EIS; impacts on visual resources are addressed in section 4.8.2.
- CO5-5 Impacts on tourism are addressed in section 4.9.3.
- CO5-6 Section 4.12.1.2 of the EIS states that the DOT PHMSA issued its LOD based on its evaluation of process releases that could result in vapor dispersion, fires, and overpressures from explosions. Also, section 4.12.1.3 of the EIS details the Zones of Concern distances from LNG marine vessel operations. In addition, section 4.12.1.6 discusses FERC staff’s review of RG LNG’s preliminary engineering design. This analysis contained various design reviews with a focus on the layers of protection or safeguards to reduce the risk of a potentially hazardous scenario from developing into an event that could impact the offsite public. If operational control of the facilities were lost and operational controls and emergency shutdown (ESD) systems failed to maintain the Project within the design limits of the piping, containers, and safety relief valves, a release could potentially occur. To mitigate this scenario, RG LNG’s design would include mitigation, such as spill containment and spacing, hazard detection, ESD and depressurization systems, hazard control, firewater coverage, structural protection, and emergency response. FERC staff has recommended further final design details be provided in section 4.12.1.7 to ensure adequate mitigation is in the final design of the proposed facility.
- CO5-7 Impacts on wetlands are addressed in section 4.4.2 of the EIS.
- CO5-8 As described in section 1.3.1 of the EIS, production and gathering activities, and the pipelines and facilities used for these activities, are not regulated by FERC, but are overseen by the affected region’s state and local agencies with jurisdiction over the management and extraction of the shale gas resource. Determining the well and gathering line locations and their environmental impact is not feasible because the market and gas availability at any given time would determine the source of the natural gas. While past, present, and reasonably foreseeable future oil and gas infrastructure within the geographic scope of the cumulative impacts assessment are addressed in section 4.13, the specific locations for infrastructure associated with induced production are not reasonably foreseeable. Further, review of the Project is limited to the economic and environmental impacts of the proposal before the Commission; therefore, the effects of LNG combustion in end-use/importing markets are outside of the scope of this EIS.

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C. Good Cause for Intervening Out of Time

The Draft Environmental Impact Statement for the Rio Grande LNG Project is currently out for comment. However, the original notice of application for authorization for the project and the time to intervene in time has passed. Therefore, to the extent this motion is out of time, SaveRGVfromLNG requests that FERC grant this intervention under the standards in 18 C.F.R. 385.214(d).

SaveRGVfromLNG has good cause for intervening at this time. The local, community-based group was organized in response to the announcement of potential LNG facilities in the Rio Grande Valley region, and its members have been participating in the associated dockets since the filing of applicable applications. However, only recently has the group had the capacity to raise funds to hire counsel to review the NEPA documents filed in this docket and to intervene as a party for actions related to these applications. SaveRGVfromLNG also has a legitimate interest in acting in a representative capacity on behalf of its members for possible future actions on these applications.

Additionally, no disruption to the proceeding will result from permitting intervention. 18 C.F.R. 385.214(d)(2). FERC has previously granted timely and untimely interventions filed in these dockets.³ Granting intervention to SaveRGVfromLNG will not disrupt or needlessly complicate proceedings in this docket, it will simply allow an organization with an affected public interest to participate as an interested party alongside other individuals and organizations who have already intervened.

SaveRGVfromLNG's interest is not necessarily adequately represented by other parties. 18 C.F.R. 385.214(d)(3). The organization has a particular purpose to organize with the local affected community regarding LNG development and associated impacts in the region and to engage in efforts to protect the health of its members. While some of its members have intervened, the organization has a direct stake in participating in future proceedings in this docket to protect the greater group's interests and to stand in the shoes of individual members who will be affected by the Project but who cannot or do not wish to individually participate.

Finally, no prejudice or additional burden on existing parties might result from permitting intervention. SaveRGVfromLNG is not aware of any conflicts with or burdens on existing intervenors. Given that approximately seventy (70) interventions have been granted in these dockets SaveRGVfromLNG does not anticipate that prejudice or additional burden will occur on

³ FE Docket CP16-454, Accession NO. 20170517-3057.

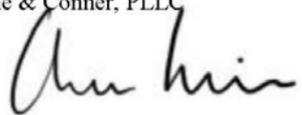
the applicants in these dockets. The group has no intention of surprising the applicants with new information or raising categories of information not already contemplated in the docket.

As of the date of this filing, the DEIS for this project is still out for comment, so environmental review is underway and Rio Grande LNG is continuing to coordinate with federal and state agencies to complete required consultations and obtain environmental permits and other authorizations. This is unlike cases in which FERC has already issued a final order and/or motions for rehearing have already been filed. Intervention at this stage will not disrupt the proceeding and is otherwise in the public interest.

SaveRGVfromLNG therefore moves to intervene in Docket Nos. CP16-454 and CP16-455 for the reasons described above.

Respectfully submitted,

Irvine & Conner, PLLC

by 

Charles W. Irvine
Michael P. McEvilly
On behalf of SaveRGVfromLNG

CO (Companies and Organizations)

CO6 - Center for Liquefied Natural Gas

CO6-1

Comment noted.

December 3, 2018



Chairman Neil Chatterjee
Federal Energy Regulatory Commission
888 First Street NE
Washington, D.C. 20426

RE: Rio Grande LNG and Rio Bravo Pipeline
Docket Nos. CP16-454-000 and CP16-455-000

Dear Chairman Chatterjee:

The Center for Liquefied Natural Gas (CLNG) appreciates the opportunity to express its support for the permitting of additional liquefied natural gas (LNG) export capacity in the United States, including NextDecade's Rio Grande LNG project to be constructed in the Port of Brownsville, a deepwater port in South Texas.

CO6-1

CLNG advocates for public policies that advance the export of LNG from the U.S. to developed and emerging markets around the world. A committee of the Natural Gas Supply Association (NGSA), CLNG represents the full LNG value chain, including LNG producers, shippers, terminal operators, and developers, providing it with unique insight into the ways in which the vast potential of this abundant and versatile fuel can be fully realized.

LNG offers tremendous benefits for consumers and the environment. Here are a few facts about LNG, its chemical properties, and the safety record of the global LNG industry:

- LNG is natural gas in liquid form chilled to -260 degrees Fahrenheit. As a liquid, LNG occupies 1/600th of the volume of gas.
- LNG is stored at ambient pressure and, when exposed to a source of heat, LNG vaporizes back into natural gas. If spilled on land or water, it vaporizes and leaves no residue behind.
- LNG is not toxic, corrosive, explosive, or flammable.
- According to the U.S. Department of Energy, "for more than 40 years, the safety record of the global LNG industry has been excellent, due to attention to detail in engineering, construction, and operations ... The physical and chemical properties of LNG render it safer than other commonly used hydrocarbons."¹

Throughout decades of safe operations, the LNG industry has proven its commitment to fully comply with regulations and take extra care to prevent accidents. As demand for natural gas rises, the LNG industry will continue to adopt, implement, and update safety measures that protect the health and well-being of all parties.

Meanwhile, technological breakthroughs in the U.S. oil and natural gas industry have unleashed an energy renaissance, establishing the U.S. as the world's largest natural gas producer. Domestic production continues to grow and, according to the Energy Information Administration (EIA), is expected to reach nearly 100 Bcf/d by 2025, driven primarily by activity in the Permian Basin and the U.S. Northeast.

The U.S. has enough natural gas to supply affordable energy domestically for the foreseeable future as well as to significantly increase U.S. participation in the highly competitive global LNG markets. Because our supply of natural gas is so abundant, operating and planned export capacity are helping provide stability to the domestic market. In some regions of the country, natural gas production has exceeded demand. LNG exports offer an important market for surplus gas, which often comes associated with oil production, and helps to keep natural gas and oil production steady and predictable.

¹ U.S. Department of Energy, "Liquefied Natural Gas: Understanding the Basic Facts," 2013.

1620 Eye Street, NW • Suite 700 • Washington, DC 20006 • (202) 239-2253 • www.lngfacts.org

CO (Companies and Organizations)

CO6 - Center for Liquefied Natural Gas

Page Two
Center for LNG letter to Chairman Chatterjee
RE: Rio Grande LNG and Rio Bravo Pipeline
Docket Nos. CP16-454-000 and CP16-455-000

Significant U.S. production growth requires new markets for natural gas beyond domestic consumption. For producers in the Permian Basin and Eagle Ford Shale, in particular, U.S. LNG projects on the Texas Gulf Coast provide energy producers an important link to global markets and a means of mitigating wasteful flaring of valuable resources into the atmosphere.

U.S. LNG exports also offer clear environmental benefits internationally. A 2014 study conducted for the U.S. Department of Energy found that LNG exports could reduce global greenhouse gas emissions by displacing more carbon-intensive fuels in importing nations.² Greater use of natural gas in importing nations will also help reduce traditional pollutants, since natural gas creates little to no emissions of sulfur dioxide, nitrogen oxides, or particulate matter that can lead to smog.³

CO6-2

LNG terminals like the proposed Rio Grande LNG project contribute significantly to the U.S. economy and generate thousands of U.S. jobs during construction and operations. LNG exports could increase U.S. GDP by between \$1.7 trillion to \$3.3 trillion and add 7.3 to 15.5 million jobs per year between 2013 and 2050.⁴ U.S. LNG projects can also play a significant role in reducing the U.S. trade deficit and increasing U.S. energy independence.

CO6-3

With global demand for natural gas only expected to grow, the U.S. has a unique opportunity to become a major global supplier of natural gas – and a limited time window to capture it and all the associated domestic and international benefits. Planned U.S. LNG projects like Rio Grande LNG will facilitate the export of abundant, reliable, clean-burning, U.S.-produced natural gas, delivering long-term economic, trade, and environmental benefits. We appreciate the FERC staff's continued commitment to the review of U.S. LNG projects, and respectfully request the final approval for all pending LNG projects, including Rio Grande LNG project and as soon as possible.

CO6-4

Respectfully,



Charlie Riedl
Executive Director
Center for Liquefied Natural Gas

² U.S. Department of Energy, National Energy Technology Laboratory, "Lifecycle Greenhouse Gas Perspective on Exporting LNG from the United States," May 29, 2014.

³ Leidos, Inc., "A Comparison of Emissions from Major Fuels Used to Generate Electricity in the U.S.," 2016.

⁴ ICF (prepared for LNG Allies), "Calculating the Economic Benefits of U.S. LNG Exports," April 17, 2018.

CO6-2 Comment noted.

CO6-3 Comment noted.

CO6-4 Comment noted.

CO (Companies and Organizations)

CO7 - Friends of Laguna Atascosa National Wildlife Refuge



Twenty Years of Ocelot Conservation
1997-2017

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The Friends is a 501(3)(c) non-profit organization whose mission it is to protect, support and enhance the Laguna Atascosa National Wildlife Refuge

Friends of Laguna Atascosa National Wildlife Refuge

22817 Ocelot Road,
Los Fresnos, TX 78566

The Friends of Laguna Atascosa National Wildlife Refuge, hereinafter referred to as FLANWR, hereby submits this comment for Rio Grande LNG and Rio Bravo Pipeline Dockets CP16-454-000 and CP16-455-000, hereinafter referred to as the Applicant.

The FLANWR is a group of organized citizens that volunteer on behalf of the Laguna Atascosa National Wildlife Refuge to assist with daily programs, sponsor special events, and assist with educational outreach activities. As a 501(3)c non-profit organization, the Friends also raise funds, and administer grants that support the mission of the Friends group.

Wildlife and Habitat

The DEIS determines that a total of 24 species that are federally listed as threatened or endangered may occur in counties affected by the project.¹ Of these species, it has been determined that the Project is likely to adversely affect the Northern aplomado falcon, the piping plover (and its critical habitat), and the ocelot. Furthermore, as identified in the DEIS specifically within the Laguna Atascosa Wildlife Refuge, indirect impacts on the ocelots may occur from an increase in ambient sound levels, which may render suitable habitat unattractive to ocelots.²

The DEIS identifies that suitable habitat would be lost within the LNG Terminal site boundaries and potentially along the pipeline route.³ Additionally, the DEIS determines that the loss of any suitable ocelot habitat, which are regularly sighted in the Project area, and potential indirect impacts on habitat within the lower Laguna Atascosa NWR, could have potentially significant impacts on ocelots; and, in accordance with the Section 7 evaluation, the proposed Project is likely to adversely affect the ocelot.⁴

It has been recognized in the DEIS that the primary threat to ocelot and jaguarundi populations in the United States is habitat loss, degradation, and fragmentation.⁵ The project furthers habitat loss, degradation, and fragmentation directly and indirectly. The destruction of rare habitat such as loma evergreen shrubland, south Texas loma grassland, and Texas salty thornscrub that provide high value for ocelots and northern aplomado falcons would directly impact these species through habitat loss. According to the DEIS, about 149,173 acres of south Texas salty thornscrub habitat has been identified along the Texas gulf coast, and more inland areas, and conversion of 138.4 acres would represent a moderate and

¹ Rio Grande LNG DEIS, V1. p30/ES-7

² Rio Grande LNG DEIS, V1. p31/ES-8

³ Rio Grande LNG DEIS, V1. p31/ES-8

⁴ Rio Grande LNG DEIS, V1. p574/4-420

⁵ Rio Grande DEIS, V1, p574/4-420

www.friendsoflagunaatascosa.org
www.SaveTexasOcelots.org

CO7-1

FERC has determined that the Project is likely to adversely affect the ocelot and jaguarundi; therefore, the FWS will further assess impacts on these species to determine if the Project would result in jeopardy of the species. Further, as discussed in section 4.7.1.4, the FWS and RG Developers are coordinating regarding mitigation for the loss of potential ocelot, jaguarundi, and northern aplomado falcon habitat; any mitigation for habitat loss for these species would be determined through completion of the ESA consultation process.

CO7-1

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permanent impact on this vegetation community.⁶ The DEIS also recognizes that due to the large home ranges of ocelots and importance of corridor habitat to connect to Mexican populations, even incremental habitat loss could be significant.⁷

Section 7 of the Endangered Species Act, as amended, states that any project authorized, funded, or conducted by any federal agencies should not "...jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species which is determined...to be critical...".

The FLANWR concludes that the permit should be denied according to Section 7 of the ESA due to the direct and indirect impacts on threatened and endangered species and habitat.

CO7-2

Rio Bravo Pipeline

Between MP 100 and MP 120, the pipeline is located along approximately 10 miles of the Laguna Atascosa NWR border. While the pipeline is about 2 miles west of the Laguna Atascosa NWR boundary, it is immediately adjacent to approximately 4 miles of the Lower Rio Grande Valley NWR boundary. Between MP 120 and MP 130, the pipeline is less than 1 mile along approximately 2 miles of the Laguna Atascosa NWR. Between MP 130 and MP 135, the Rio Bravo Pipeline is adjacent to approximately 3 miles of the Laguna Atascosa NWR. Two locations along the pipeline route come within feet of the Laguna Atascosa NWR, 52.8 feet southeast of MP 126.0 and within 52.8 feet north of the route between MP 132.3 and MP 135.5. The DEIS identifies indirect impacts of the pipeline on the Laguna Atascosa NWR that may occur during construction, including disturbance from increased noise and nighttime lighting.⁸

In addition to noise and lighting, the FLANWR views that the Rio Bravo Pipeline also indirectly impacts the Laguna Atascosa NWR due to the destruction of adjacent habitat and construction operations including vehicular movement and would also directly impact the health and well-being of Refuge workers and tourist visitors at the Bahia Grande Unit and should be reflected as such in the DEIS.

CO7-3

Rio Grande Terminal

The Laguna Atascosa NWR is within 0.25 mile of a project workspace at the northern boundary of the LNG Terminal site. The DEIS states the Laguna Atascosa NWR would not be directly affected by construction, however indirect impacts on the Laguna Atascosa NWR may occur during construction and operation of the proposed Project, including disturbance from increased noise and nighttime lighting associated with Project facilities.⁹ Within a 1-mile radius, construction noise would be about 60dBA. In total, about 2,464

⁶ Rio Grande DEIS, V1, p236/4-82

⁷ Rio Grande DEIS, V1, p574/4-420

⁸ Rio Grande DEIS, V1, p250/4-96

⁹ Rio Grande DEIS, V1, p250/4-96

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CO7-2

The Biological Assessment (BA) provided in section 4.7 of the final EIS has been revised in accordance with FWS correspondence and concludes that the Project is not likely to adversely affect the northern aplomado falcon and piping plover and would not result in the adverse modification of critical habitat. Our determination of effect for the ocelot remains, and our current determination for the jaguarundi, is "likely to adversely affect." Nevertheless, a "likely to adversely affect" determination is not reason to deny a permit under Section 7 of the ESA. Rather, the ESA requires that, if a project is likely to adversely affect a threatened or endangered species, the federal action agency (in this case, FERC) must conduct formal consultations with the FWS. This process requires the FWS to prepare a Biological Opinion for the Project.

CO7-3

Impacts on recreation and special use areas, including the Laguna Atascosa NWR, are addressed in sections 4.8.1.5 and 4.9.3; section 4.9.3 was updated to discuss potential impacts on planned facilities in the Bahia Grande unit of the Laguna Atascosa National Wildlife Refuge (NWR). Impacts associated with visual resources for these areas are addressed in section 4.8.2. As described in section 4.9.8.1, traffic associated with construction and operational of the proposed facility would be within the planned capacity of SH-48. LNG Terminal safety is addressed in section 4.12.1 of the EIS. As stated in section 4.7.1 of the EIS, prescribed burning, although not allowed on the LNG Terminal site itself, would not be precluded in the adjacent areas. In addition, the northern edge of the project site would be bounded by a 4 lane state highway (SH-48) as well as a 17-foot storm levee. Furthermore, onsite process equipment would be installed at a distance of over 500 feet from SH-48. This would provide sufficient separation distances between any prescribed wild fires and onsite process equipment. We also note that hot embers from wildfires or prescribed burns could reach onsite equipment and piping, however metal components and paving around these components would not be considered a fuel source and would not be susceptible to catching fire. If hot embers did ignite onsite components, RG LNG's proposed hazard and fire mitigation measures described in Section 4.12.1.6 of the EIS would be activated as needed.

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acres of the Laguna Atascosa NWR would fall within a 1-mile radius of terminal construction, of which about 437 acres (17.7 percent) are classified as having scrub-shrub vegetation (TPWD 2017a), ideal habitat for the ocelot.¹⁰

Indirect effects on the Laguna Atascosa NWR will occur from an increase in ambient sound levels for the life of the Project.¹¹ The sound level associated with LNG Terminal operations is estimated to be 71.4 dBA, and would result in an expected increase of about 11.9 dB over ambient levels (see table 4.7.1-4). This increase in noise could result in moderate impacts on wildlife through increased avoidance of areas immediately adjacent to the LNG Terminal site.¹² Impacts on wildlife associated with construction of the LNG Terminal and offsite facilities would include displacement, stress, and direct mortality of some individuals.¹³

The permanent reduction in available habitat within the LNG Terminal fenceline, as well as the influx of individuals to other nearby areas, may increase local population densities, resulting in increased inter- and intra-specific competition and reduced reproductive success of individuals.¹⁴

In addition to potential indirect effects of land-based construction and operation, the LNG Terminal site is adjacent to the Bahia Grande Channel, which leads to the Bahia Grande. The Bahia Grande, a 6500-acre shallow bay immediately north of the proposed LNG Terminal site, is part of the Bahia Grande Unit of the Laguna Atascosa NWR, and is classified as a sensitive waterbody. The restoration of the Bahia Grande is one of the largest wetland restoration projects in the United States. According to the DEIS, potential construction and operational impacts on nearby surface waters include the effects of dredging and dredged material placement; construction of LNG Terminal facilities, including the marine berths and turning basin; vessel traffic; site modification and stormwater runoff; water use, including hydrostatic testing and operation of the firewater system; and spills or leaks of hazardous materials.¹⁵

The FLANWR views that construction of the terminal as also indirectly impacting the LANWR due to the destruction of adjacent habitat and construction operations, particularly with vehicular movement, and should be reflected as such in the DEIS. While adjacent habitat is not within the Laguna Atascosa boundaries, adjacent habitat is used by species for movement into the Refuge. Construction and operation of the terminal would displace and stress wildlife the Refuge is designed to conserve, protect, and provide resources for.

CO7-4

Impacts from light and sound from terminal operations are physical changes to the landscape and should be considered as an operational footprint of the Project. Therefore,

CO7-5

¹⁰ Rio Grande DEIS, V1. p306/4-152

¹¹ Rio Grande DEIS, V1. p306/4-152

¹² Rio Grande DEIS, V1. p250/4-96

¹³ Rio Grande DEIS, V1. p239/4-85

¹⁴ Rio Grande DEIS, V1. p239/4-85

¹⁵ Rio Grande DEIS, V1. p191/4-37

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CO7-4

Impacts on wildlife and threatened and endangered species within the Laguna Atascosa NWR are discussed in sections 4.6.1 and 4.7, respectively.

CO7-5

Comment noted. Light and sound impacts inherently extend beyond the direct footprint of a facility. As such, the EIS fully analyses and considers these impacts on all areas potentially affected by light and sound. These impacts are presented throughout the EIS, including in sections 4.6, 4.7, 4.8, and 4.11.2.

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1997-2017*

FLANWR concludes the permit should be denied due to the current terminal design in which the operational footprint extends beyond the terminal boundaries into the Laguna Atascosa NWR, into the Lower Rio Grande NWR, and the wildlife corridor.

CO7-5

The FLANWR has also determined that additional temporary workspaces that extend into the Lower Rio Grande NWR is not an appropriate use of NWR lands nor does it fit with the purpose of the designated lands. NWR lands and wetlands should not be used for workspace.

CO7-6

Water quality impacts, including increased sedimentation and the potential for accidental spills into adjacent aquatic habitats, including the sensitive Bahia Grande via the Bahia Grande Channel, should be considered a significant impact. The FLANWR concludes that the permit should be denied given the terminals proximity to the Bahia Grande Channel and the possibility of water quality impacts to this sensitive aquatic habitat.

CO7-7

In addition, air quality impacts to the health of Refuge workers and visitors to the Bahia Grande Unit of LANWR, and to recreational fishermen in the vicinity of the terminal, have not been addressed by the DEIS and must be considered. According to Next Decade's permit application to TCEO, people in this close proximity to the terminal would be exposed to potentially dangerous pollutants from emissions.

CO7-8

Wildlife Corridor

The wildlife corridor is an easement of BND land leased to the USFWS in 2004 for a 19-year lease 2.4 miles west of the Project boundary. This was leased to provide north and south migration for wildlife between the Laguna Atascosa NWR and the Lower Rio Grande NWR of which the ship channel divides. This land adds to the biodiversity of the Laguna Atascosa NWR. Noise and light impacts will result in an environment that wildlife (particularly migratory birds and nocturnal species such as ocelots) will avoid at the Wildlife Corridor.

The FLANWR concludes that sound and light are physical changes to the landscape and should be considered as a part of the operational footprint of the terminal. The operational footprint should not extend beyond the project boundaries. Thus the permit should be denied or terminal design changes should be made. All indirect and direct impacts to lands should be mitigated for, including mitigation of the wildlife corridor.

CO7-9

Socioeconomics

As stated in the DEIS, construction would not prohibit visitors from using recreational areas, sights and sounds of pipeline construction activities may be a nuisance to visiting tourists, and could generally interfere with or diminish the quality of their experience.¹⁶ The DEIS additionally states: "neither construction nor operation would be expected to significantly impact tourism..."

¹⁶ Rio Grande DEIS, V1. P.363/4-209

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CO7-6

As discussed further in section 4.8.1.5, RB Pipeline adjusted the Project workspaces in the area of the Lower Rio Grande Valley NWR, as such these lands would no longer be directly impacted.

CO7-7

Comment noted. As described in section 4.3.2.2 of the EIS, because RG Developers would be required to meet the water quality standards in applicable state and federal permits, including COE permit requirements for dredging, impacts from sedimentation on water quality would not be significant. Further, RG LNG would implement the measures in its SPCC Plan during construction, including spill prevention measures, mitigation measures, and reporting and cleanup methods to reduce potential impacts should a spill occur.

CO7-8

As described in section 4.11.1, potential pollution emissions from the LNG Terminal site, when considered with background concentrations, would be below the NAAQS, which are designated to protect public health including sensitive populations such as children, the elderly, and asthmatics. Section 4.11.1 was revised to clarify that the air quality model evaluates pollutant concentrations at the facility fence line. Therefore, the air quality assessment in the EIS includes individuals in the vicinity of the LNG Terminal.

CO7-9

Comment noted. Light and sound impacts inherently extend beyond the direct footprint of a facility. As such, the EIS fully analyses and considers these impacts on all areas potentially affected by light and sound. These impacts are presented throughout the EIS, including in sections 4.6, 4.7, 4.8, and 4.11.2.

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There is no data to support this statement. Port Isabel, South Padre Island and Laguna Atascosa NWR are all very nature tourist-dependent. Furthermore, these communities are opposed to the construction of LNG Terminals due to the potential effects on tourism. Interview-type studies need to be done with out-of-area tourists to meaningfully assess this impact. Petrochemical industrialization drives away nature tourism.

CO7-10

The FLANWR agree that construction and operation of the Project would interfere or diminish the quality and experience with regards to the Laguna Atascosa NWR, particularly in the Bahia Grande Unit. This negates from economic benefits claimed by the Applicant. Thus, the FLANWR view the economic analysis by the Applicant is inadequate and narrow in view. Impacts on all types and areas of recreation and tourism, which includes the Laguna Atascosa NWR, during years of construction and operation should be reflected in the economic analysis. The analysis should be in concert with those that would be affected such as the FLANWR, area businesses, eco-tour guides, etc. Additional analysis on micro and macro costs of climate change are also not included. Costs imposed on the Laguna Atascosa NWR will increase during years of operation due to the consequences of climate change.

CO7-11

Other Factors and Trends

The Living Wildlife Report found in its latest Living Planet Index that the wildlife population has declined by 60% in the last 40 years worldwide.¹⁷ Between 95-98% of the native landscape in the RGV has been cleared for urban, agricultural, or industrial use. About 91% has been destroyed in Cameron County, where the terminal will be built. Given the macro and micro trends, this places native habitat in our region at a greater importance and value. The location of Rio Grande LNG further segments habitat and will impact wildlife migration between the Laguna Atascosa and Lower Rio Grande Valley Refuges. The direct and indirect impacts will have a large-scale impact environmentally.

CO7-12

It must be noted that many years and efforts towards conservation and preservation of native land and habitat have occurred in the region where the Project is proposed. This demonstrates strong social and cultural values to conservation and preservation of native habitat. These efforts have included citizens and organizations at all levels from municipal to federal and has led to the creation of, but not limited to;

1. Lower Rio Grande Valley NWR
2. The Laguna Atascosa NWR
3. Loma Ecological Preserve
4. Wildlife Corridor
5. Bahia Grande Restoration Project

¹⁷
<https://e402277.ssl.cf1.rackcdn.com/publications/1187/files/original/LPR2018-Full-Report-Spreads.pdf>

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CO7-10

The EIS recognizes the Project’s impacts on eco-tourism in section 4.9.3, including an increase in noise, changes in the visual landscape, and heavier traffic along SH-48. Recreation and special use areas, including birding trails, that are in proximity to the Project are addressed in section 4.8.1.5, while impacts on visual receptors at recreation and special use areas are addressed in section 4.8.2. We find that impacts on tourism, including nature-based and eco-tourism, would generally be greatest during construction of the Project. Following construction, the LNG Terminal would be the primary source of permanent impacts on tourism as the pipelines would be buried and the associated aboveground facilities would be in remote areas, offering limited visibility and mitigating noise impacts. To mitigate impacts on visual receptors and operational noise from the LNG Terminal, RG LNG would use ground flares, grey tank coloring, horticultural plantings, and the construction of a levee that would obstruct most construction activities and low-to- ground operational facilities from view. We find that no visual or noise impacts on South Padre Island beaches and associated tourism would occur, given that the beaches face the ocean and are 5 miles away. However, we do recognize impacts on recreational fishing boats for trips that begin from Port Isabel or South Padre Island, in the form of delays at Brazos Santiago Pass if they arrive during LNG carrier transit. As further described in section 4.9.3.1, most nature tourism facilities at the Laguna Atascosa NWR, including Boca Chica Beach, are far enough away from the LNG Terminal site that they would not be impacted by construction.

CO7-11

See Comment Response CO7-10. Also, sections 4.9.3 and 4.13 have been updated to include additional discussion of the Project’s impacts on the Bahia Grande Unit, and specifically to address the planned opening of the Bahia Grande (Red Gate Entrance). Overall, we anticipate that local visitation patterns may change but the number of visits to the Project area would likely not. We further conclude that employment in the tourism industry is not likely to be adversely affected. Section 4.13.2.9 of the final EIS was revised to assess the appropriateness of the Social Cost of Carbon (SCC) analysis to determine the significance of Project GHG emissions. We recognize the availability of the SCC tool, but conclude that it is not appropriate for use in project analyses. In addition, see response CO8-1 for additional information regarding the analysis of the SCC.

CO7-12

Section 4.13.2.7 of the final EIS was revised to address the comment regarding community values.

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- 6. Federal Ocelot Recovery Plan
- 7. The recent conservation of 3,200 acres on South Padre Island and several hundred acres along the Bahia Grande near Port Isabel

LNG projects negate the work and continued efforts of the citizens, organizations, government resources, and millions of dollars put forth over the time span of many decades. Thus, permitting of LNG projects that pose direct and indirect impacts outside of the Port of Brownsville boundaries should be denied. LNG projects negate from the monies and efforts and are in direct conflict with social and cultural values of the region and should be denied permits. Permitting of LNG projects that continue the trend of destroying the last remaining ecosystems in the RGV should be denied.

CO7-12

Much of Rio Grande LNG's proposals are to mitigate lands already leased, protected, and managed by the U.S. Fish & Wildlife Service which include the Loma Ecological Preserve. Such plans are not viewed by the public, nor should it be accepted by the agencies, as a viable or acceptable proposal. Their proposals result in a net loss of habitat and wetlands and not in accordance to federal policy. The RGV cannot afford net losses at a time when only 2-5% of the native environment remain.

CO7-13

FLANWR views proposed mitigation as grossly inadequate. All lands affected directly and indirectly needs mitigation. FLANWR views the lack of mitigation in surrounding areas will negatively impact the Refuge.

Conclusionary Statement

The FLANWR oppose the Rio Grande LNG and Rio Bravo Pipeline project. As stated in the DEIS, there are too many costs (e.g. social, economic, environmental, etc.) to justify permitting LNG projects such as the Applicant's. The Applicant has not demonstrated need for the Project nor is it stated in the DEIS. There are no buyers for the LNG, no "binding contracts." For a project with so many negative impacts an unequivocal need for the Project must be shown. For this reason, and all the reasons aforementioned, the permit for Rio Grande LNG and Rio Bravo Pipeline should be denied.

CO7-14

Sincerely,



Nicole Ekstrom, President

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CO7-13

As described in section 4.4.2 of the EIS, wetland mitigation plans are part of the permitting process associated with Section 404 of the CWA. RG LNG's final wetland mitigation plans would be developed and submitted to the COE, and would be implemented in addition to the construction mitigation measures outlined in RG LNG's Procedures and the measures described in the EIS. Construction of the LNG Terminal would not commence prior to finalization of the wetland mitigation plans and issuance of the COE's CWA Section 404/Section 10 permit.

CO7-14

Under Section 3 of the NGA, oversight for LNG export is divided between the Commission and the DOE. FERC is responsible for approving the safe and sound siting and operation of LNG facilities, given that DOE has approved the export of the commodity. It is the DOE, not the Commission, which retains the exclusive authority over the export of the natural gas as a commodity, including the responsibility to consider whether the exportation of that gas is consistent with the public interest. As described in section 1.1 of the EIS, the DOE granted an authorization to RG LNG for export to countries having a FTA with the United States that includes national treatment for trade in natural gas. In accordance with the NGA and Energy Policy Act of 1992, export to a country with which there is an FTA requiring national treatment for trade in natural gas, is deemed consistent with the public interest. Further, RB Pipeline executed a precedent agreement for the total capacity of the Rio Bravo Pipeline for the 20-year life of the Project, which establishes a basis for a finding by the Commission that the pipeline will be in the public convenience and necessity under Section 7.



December 3, 2018

To: Federal Energy Regulatory Commission

Subject: Failure to Use the Social Cost of Greenhouse Gases in the Rio Grande LNG Project Draft Environmental Impact Statement—Docket Nos. CP16-454-000, CP16-455-000

This draft environmental impact statement (DEIS), prepared by the Federal Energy Regulatory Commission (FERC), on the Rio Grande LNG Project, reviews the proposal to “site, construct, and operate facilities necessary to liquefy and export natural gas.”¹ While the DEIS quantifies the tons of direct greenhouse gas emissions related to this project—over 8 million metric tons of carbon dioxide equivalent units per year from operations, plus hundreds of thousands of tons per year during construction—FERC fails to use the social cost of greenhouse gas metric to fully account for the climate effects of these emissions. FERC recapitulates flawed arguments used in other inadequate NEPA reviews to implicitly explain why the Commission refuses to use the social cost of greenhouse gases metric for the project. Specifically, FERC claims that it is impossible to determine the significance of this project’s climate impacts.² Not only is this incorrect, but failing to meaningfully analyze a project’s climate effects violates the National Environmental Protection Act (NEPA).

These comments begin by offering a more detailed rejection of FERC’s arbitrary and misleading rationale for failing to use the social cost of greenhouse gases, before offering additional guidance on how to monetize climate effects consistent with the currently best available science and economics—specifically, by selecting a central estimate of global damages using a 3% or lower discount rate.

1. FERC Must Monetize the Social Cost of Greenhouse Gases in Its EIS

FERC details the alleged benefits of the proposed action, but neither includes a substantive discussion of the project’s specific climate effects nor a monetization of the projected emissions as a way of assessing the project’s contribution to climate damages. Although FERC does not include a fully monetized cost-benefit analyses in its NEPA reviews, FERC does monetize socioeconomic benefits in the DEIS.³ Moreover, monetizing climate effects provides useful and necessary contextual information under NEPA regardless of whether all other costs and benefits have been monetized. As Commissioner LaFleur, one of the dissenting Commissioners in the Sabal Trail Pipeline remand order, noted, the Social Cost of Carbon was developed to inform decisions on proposed actions and evaluate the significance of greenhouse gas emissions.⁴

Here, though FERC quantified the tons of direct greenhouse gas emissions from operations and construction, FERC nonetheless fails to discuss the actual, specific climate impacts of the project. FERC neither quantitatively nor qualitatively discusses the damages to which these additional tons of greenhouse gases would contribute. Meanwhile, FERC has monetized effects like millions of dollars’

¹ FERC, Draft Environmental Impact Statement for Rio Grande LNG Project at ES-1 (2018) [hereinafter “DEIS”].

² DEIS at ES-17, 5-22.

³ DEIS at ES-10.

⁴ Sabal Trail Remand Order at (Comm’r LaFleur, dissenting in part) at 3, available at <https://www.ferc.gov/CalendarFiles/20180314230126-CP14-554-002.pdf>.

CO8-1

CO8-1

The general nature of the comments is that GHG emissions should be monetized because other socioeconomic costs and benefits are monetized in the EIS; quantifying the SCC would give context to the climate damages associated with project GHG emissions; SCC is appropriate for analyzing project-level emissions of the magnitude of the Project; FERC must use the SCC tools that reflect currently available data and methodologies, and; FERC must quantify global damages associated with project GHG emissions. The SCC tool, as well as the Social Cost of Methane and Nitrous Oxide tools, estimates the monetized climate change damage associated with an incremental increase in carbon dioxide (CO₂) emissions in the given year. It estimates the cost today of future climate change damage, represented by a series of annual costs per metric ton of emissions discounted to present-day value. We recognize the availability of the SCC tool, but conclude that it is not appropriate for use in project analyses for the following reasons:

(1) The SCC is not meaningful in our NEPA analysis for project decisions under the NGA. We believe that the SCC tool is more appropriately used in NEPA analyses by regulators whose responsibilities are tied more directly to fossil fuel production or consumption. The Commission’s authority under Sections 3 and 7 of the NGA has no direct connection to the production or end use of natural gas. The Commission does not control the production or consumption of natural gas. Producers, consumers, and their intermediaries respond freely to market signals about location-specific supply and location-specific demand. The Commission oversees proposals to transport natural gas between those locations. Our NEPA analysis considers all construction emissions and annual operational GHG emissions that are causally related to the proposed action that is before the Commission.

(2) FERC staff does not use monetized cost-benefit analyses as part of the NEPA review. Siting infrastructure involves making qualitative judgments between different resources as to which there is no agreed-upon quantitative value. As such, we do not conduct a monetary cost-benefit analysis in our NEPA review. The draft EIS did quantify some of the Project’s direct socioeconomic benefits (e.g., employment and tax payments) because those benefits occur in units of dollars and are directly comprehensible in units of dollars. However, because Commission staff lack quantified information about all of the costs and benefits of the Project, the final EIS does not use the limited available quantified benefits in a cost-benefit analysis to inform Commission staff’s comparison of alternatives, choices of mitigation measures, or determination about the significance of the Project’s environmental impacts. FERC staff notes that the Project draft EIS used various tools and measurements to disclose and quantify potential impacts associated with the Project. FERC staff chose quantification tools appropriate to each individual resource. For example, the EIS used acres of wetland disturbance, number of existing residences within 50 feet of the proposed construction right-of-way, decibels of noise associated with operation of aboveground facilities, and, as presented in section 4.9.2 of the draft EIS, dollar amounts were estimated to present potential economic effects of the Project. For GHG emissions, FERC staff used tons of GHG emissions to quantify and disclose the potential impacts of GHG emissions associated with the Project. We believe that providing estimated tons of GHG emissions was an appropriate tool to use to quantify the potential GHG impacts associated with the Project.

(3) The SCC tool has technical limitations that limit its usefulness in NEPA analyses for Commission certificate proceedings. FERC staff acknowledges that the SCC methodology does constitute a tool that can be used to estimate incremental physical climate change impacts. The integrated assessment models underlying the SCC tool were developed to estimate certain global and regional physical climate change impacts due to incremental GHG emissions under specific socioeconomic scenarios. However, the EPA states that “no consensus exists on the appropriate [discount] rate

worth in tax revenue and payroll expenditures.⁵ Failing to similarly monetize the climate costs of the project is inconsistent and arbitrary, and deprives the public and decisionmakers of the information and context they need to weigh all of the project's potential effects.

Below is a review of the case law on when it is arbitrary to fail to include the social cost of greenhouse gases in NEPA analysis, and an explanation of why a recent Executive Order does not change the need to monetize climate damages.

NEPA Requires Monetizing Climate Effects If Other Costs and Benefits Are Monetized

NEPA requires “hard look” consideration of beneficial and adverse effects of each alternative option for major federal government actions. The U.S. Supreme Court has called the disclosure of impacts the “key requirement of NEPA,” and held that agencies must “consider and disclose the actual environmental effects” of a proposed project in a way that “brings those effects to bear on [the agency’s] decisions.”⁶ Courts have repeatedly concluded that an EIS must disclose relevant climate effects.⁷ Though NEPA does not require a formal cost-benefit analysis,⁸ agencies’ approaches to assessing costs and benefits must be balanced and reasonable. Courts have warned agencies that “[e]ven though NEPA does not require a cost-benefit analysis,” an agency cannot selectively monetize benefits in support of its decision while refusing to monetize the costs of its action.⁹

In *High Country Conservation Advocates v. Forest Service*, the U.S. District Court of Colorado found that it was “arbitrary and capricious to quantify the benefits of the lease modifications and then explain that a similar analysis of the costs was impossible when such an analysis was in fact possible.”¹⁰ The court explained that, to support a decision on coal mining activity, the agencies had “weighed several specific economic benefits—coal recovered, payroll, associated purchases of supplies and services, and royalties,” but arbitrarily failed to monetize climate costs using the readily available social cost of carbon protocol.¹¹ Similarly, in *Montana Environmental Information Center v. Office of Surface Mining (MEIC v. OSM)*, the U.S. District Court of Montana followed the lead set by *High Country* and likewise held an environmental assessment to be arbitrary and capricious because it quantified the benefits of action (such as employment payroll, tax revenue, and royalties) while failing to use the social cost of carbon to quantify the costs.¹²

⁵ DEIS at 4-203. See Sabal Remand Order (Comm’r Glick, dissenting at 8) (“Rejecting this [SCC] tool on the grounds that the Commission has ‘no basis for determining the significance’ of the impact amounts is arbitrary and capricious, given that the Commission relies on similar analysis elsewhere in the EIS.”).

⁶ *Baltimore Gas & Elec. Co. v. Natural Res. Def. Council*, 462 U.S. 87, 96 (1983).

⁷ As the Ninth Circuit has held: “[T]he fact that climate change is largely a global phenomenon that includes actions that are outside of [the agency’s] control . . . does not release the agency from the duty of assessing the effects of its actions on global warming within the context of other actions that also affect global warming.” *Ctr. for Biological Diversity v. Nat’l Highway Traffic Safety Admin.*, 538 F.3d 1172, 1217 (9th Cir. 2008); see also *Border Power Plant Working Grp. v. U.S. Dep’t of Energy*, 260 F. Supp. 2d 997, 1028-29 (S.D. Cal. 2003) (failure to disclose project’s indirect carbon dioxide emissions violates NEPA).

⁸ 40 C.F.R. § 1502.23 (“[T]he weighing of the merits and drawbacks of the various alternatives need not be displayed in a monetary cost-benefit analysis.”).

⁹ *High Country Conservation Advocates v. Forest Service*, 52 F. Supp. 3d 1174, 1191 (D. Colo. 2014); accord. *MEIC v. Office of Surface Mining*, 15-106-M-DWM, at 40-46 (D. Mt., August 14, 2017) (holding it was arbitrary for the agency to quantify benefits in an EIS while failing to use the social cost of carbon to quantify costs, as well as arbitrary to imply there would be no effects from greenhouse gas emissions).

¹⁰ 52 F. Supp. 3d at 1191.

¹¹ *Id.*

¹² 15-106-M-DWM, at 40-46, Aug. 14, 2017 (also holding that it was arbitrary to imply that there would be zero effects from greenhouse gas emissions).

CO8-1

to use for analyses spanning multiple generations” and consequently, significant variation in output can result. Additionally, there are no established criteria identifying the monetized values that are to be considered significant for NEPA reviews. Therefore, although the integrated assessment models could be run through a first phase to estimate global and regional physical climate change impacts from Project-related GHG emissions, we would still have to arbitrarily determine what potential increase in atmospheric GHG concentration, rise in sea level, rise in sea water temperatures, and other calculated physical impacts would be significant for a particular pipeline project. Because we have no basis to designate a particular dollar figure calculated from the SCC tool as “significant,” such action would be arbitrary and would meaningfully inform neither the NEPA conclusions nor the public. For these reasons, FERC staff chose not to use the SCC tool in the NEPA analysis for this Project.

Both *High Country* and *MEIC v. OSM* were in line with *Center for Biological Diversity v. National Highway Traffic Safety Administration*.¹³ In that case, the U.S. Court of Appeals for the Ninth Circuit ruled that, because the agency had monetized other uncertain costs and benefits of its vehicle fuel efficiency standard—like traffic congestion and noise costs—its “decision not to monetize the benefit of carbon emissions reduction was arbitrary and capricious.”¹⁴ Specifically, it was arbitrary to “assign[] no value to the most significant benefit of more stringent [vehicle fuel efficiency] standards: reduction in carbon emissions.”¹⁵ When an agency bases a rulemaking on cost-benefit analysis, it is arbitrary to “put a thumb on the scale by undervaluing the benefits and overvaluing the costs.”¹⁶

CO8-1

A few other cases from different courts that have declined to rule against failures to use the social cost of carbon in NEPA analyses are all distinguishable by the scale of the action or by whether other effects were quantified and monetized in the analysis.¹⁷ In particular, in *EarthReports v. FERC*, the D.C. Circuit never addressed or ruled on whether it is arbitrary to monetize benefits while not monetizing costs.¹⁸ More recently, the D.C. Circuit confirmed that NEPA requires a rigorous analysis of climate effects and, in its remand to FERC, required the agency to explain and justify its position if it decides not to use the social cost of greenhouse gases.¹⁹ FERC has now once again repeated that mistake of failing to address the relevance of the social cost of greenhouse gases.

In this DEIS, FERC devoted significant attention to the “economic benefits” of approving the project.²⁰ FERC monetizes economic benefits, including billions in expenditures, tax revenue, and incomes.²¹ FERC specifically refers to these effects as the project’s “moderate, permanent, and positive impact on the local economy.”²²

Because FERC has monetized the economic benefits of the project, it must treat the climate costs with proportional analytical rigor and apply the social cost of greenhouse gas metrics. Moreover, in obligating agencies to take “hard look” at projects’ climate impacts, NEPA requires more than simply disclosing the volume of anticipated emissions.²³ As discussed further below, under NEPA, agencies must provide details on discrete effects of a project’s impacts within the relevant context. The social cost of greenhouse gases provides this critical information.

The importance of this “hard look” consideration is not lost on all members of the Commission. FERC Commissioner Glick, in his dissenting opinion to the Sabal Trail Pipeline remand order, strongly condemns the Commission’s wholly inadequate treatment of that pipeline’s climate effects: “Willful ignorance of readily available analytical tools to support an enhanced qualitative assessment for the

¹³ Three other cases from different courts that have declined to rule against failures to use the social cost of carbon in NEPA analyses are all distinguishable by the scale of the action or by whether other effects were quantified and monetized in the analysis. See *League of Wilderness Defenders v. Connaughton*, No. 3:12-cv-02271-HZ (D. Ore., Dec. 9, 2014); *EarthReports v. FERC*, 15-1127, (D.C. Cir. July 15, 2016); *WildEarth Guardians v. Zinke*, 1:16-CV-00605-RJ, at 23-24, (D. N.M. Feb. 16, 2017).

¹⁴ 538 F.3d 1172, 1203 (9th Cir. 2008).

¹⁵ *Id.* at 1199.

¹⁶ *Id.* at 1198.

¹⁷ See *League of Wilderness Defenders v. Connaughton*, No. 3:12-cv-02271-HZ (D. Ore., Dec. 9, 2014); *EarthReports v. FERC*, 15-1127, (D.C. Cir. July 15, 2016); *WildEarth Guardians v. Zinke*, 1:16-CV-00605-RJ, at 23-24, (D. N.M. Feb. 16, 2017).

¹⁸ 828 F.3d at 956 (basing its ruling on alleged uncertainty over the discount rate and lack of clear significance thresholds).

¹⁹ *Sierra Club v. FERC*, No. 16-1329, 2017 WL 3597014, at *10 (D.C. Cir. Aug. 22, 2017).

²⁰ DEIS at 4-203; see also *id.* at ES-10 (“Construction . . . would stimulate the economy.”).

²¹ *Id.* at 4-203 to 4-205, 4-213 to 4-214.

²² *Id.* at ES-10.

²³ *Supra* notes 6-7.

single largest environmental threat in our lifetime will undermine informed public comments and informed decisionmaking.”²⁴

The Social Cost of Greenhouse Gases Metrics Give Necessary Context to Climate Damages

FERC makes no effort to satisfy its NEPA obligations to provide the public and decisionmakers with a meaningful discussion of the project’s climate impacts. According to the DEIS, “[t]here is no standard methodology to determine how the Project’s incremental contribution to GHGs would translate into physical effects on the global environment . . . [or] whether or not the Project’s contribution to cumulative impacts on climate change would be significant.”²⁵ However, the social cost of greenhouse gases metric was designed to do just that, attribute discrete climate effects to additional tons of greenhouse gas emissions from proposed actions or projects.

Monetizing climate damages provides the informational context required by NEPA, while a purely quantitative estimate of tons or a qualitative description of discrete climate effects like sea-level rise provide little context. Courts review NEPA documents “under an arbitrary and capricious standard,” which requires “a reasonably thorough discussion of the significant aspects of the probable environmental consequences,” to “foster both informed decisionmaking and informed public participation.”²⁶ In particular, “the impact of greenhouse gas emissions on climate change is precisely the kind of cumulative impact analysis that NEPA requires,” and it is arbitrary to fail to “provide the necessary contextual information about the cumulative and incremental environmental impacts.”²⁷

To “provide the necessary contextual information,” economic theory shows that one useful tool is monetization of environmental impacts. As Professor Cass Sunstein has explained, drawing from the work of recent Nobel laureate economist Richard Thaler, a well-documented mental heuristic called “probability neglect” causes people to irrationally reduce small probability risks entirely down to zero.²⁸ In this case, for example, many decisionmakers and interested citizens would wrongly reduce down to zero the climate risks associated with emissions that FERC calculates here because FERC indicates that there is no way to assess the damage from a single project and implies that their impact is negligible. Yet the monetized expected cost of the climate risks associated with the millions of tons of additional emissions per year—representing damages of hundreds of millions of dollars—is less likely overlooked. As the Environmental Protection Agency’s website explains, “abstract measurements” of so many tons of greenhouse gases can be rather inscrutable for the public, unless “translat[ed] . . . into concrete terms you can understand.”²⁹ Monetization contextualizes the significance of the additional tons of emissions.

Similarly, non-monetized effects are often irrationally treated as worthless.³⁰ On several occasions, courts have struck down administrative decisions for failing to give weight to non-monetized effects.³¹ Most relevantly, in *Center for Biological Diversity v. NHTSA*, the U.S. Court of Appeals for the Ninth

²⁴ Glick opinion at 8.

²⁵ DEIS at ES-17.

²⁶ *Ctr. for Biological Diversity*, 538 F.3d at 1194 (citations omitted). See also *Montana Env’tl. Info. Ctr. v. Office of Surface Mining*, cv 15-106-M-DWM, at 12-13 (D.Mt., Aug. 14, 2017).

²⁷ *Ctr. for Biological Diversity*, 538 F.3d at 1217; see also *Montana Env’tl. Info. Ctr.*, cv 15-106-M-DWM at 45.

²⁸ Cass R. Sunstein, *Probability Neglect: Emotions, Worst Cases, and Law*, 112 Yale L. J. 61, 63, 72 (2002).

²⁹ EPA, Greenhouse Gas Equivalencies Calculator, <https://web.archive.org/web/20180212182940/https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator> (last updated Sept. 2017).

³⁰ Richard Revesz, *Quantifying Regulatory Benefits*, 102 Cal. L. Rev. 1424, 1434-35, 1442 (2014).

³¹ See *id.* at 1428, 1434.

CO8-1

Circuit found it arbitrary and capricious to give zero value “to the most significant benefit of more stringent [fuel economy] standards: reduction in carbon emissions.”³²

FERC is required by NEPA to provide enough context to ensure that the public and decisionmakers would not overlook the associated climate risks. Monetization is one way that FERC could provide the necessary context to foster both informed decisionmaking and informed public participation.³³ By comparison, simply tallying the volume of emissions fails to give the public and decisionmakers the required information about the magnitude of discrete climate effects from those emissions. The social cost of greenhouse gas metric provides that necessary context.

New Executive Order Encourages Continued Monetization of the Social Cost of Greenhouse Gases

Executive Order 13,783 officially disbanded the Interagency Working Group on the Social Cost of Greenhouse Gases (IWG) and withdrew its technical support documents that underpinned their range of estimates.³⁴ Nevertheless, Executive Order 13,783 assumes that federal agencies will continue to “monetiz[e] the value of changes in greenhouse gas emissions” and instructs agencies to ensure such estimates are “consistent with the guidance contained in OMB Circular A-4.”³⁵ Consequently, while FERC and other federal agencies no longer benefit from ongoing technical support from the IWG on use of the social cost of greenhouse gases, by no means does the new Executive Order imply that agencies should not monetize important effects in their regulatory analyses or environmental impact statements. In fact, Circular A-4 instructs agencies to monetize costs and benefits whenever feasible.³⁶ The Executive Order does not prohibit agencies from relying on the same choice of models as the IWG, the same inputs and assumptions as the IWG, the same statistical methodologies as the IWG, or the same ultimate values as derived by the IWG. To the contrary, because the Executive Order requires consistency with Circular A-4, as agencies follow the Circular’s standards for using the best available data and methodologies, they will necessarily choose similar data, methodologies, and estimates as the IWG, since the IWG’s work continues to represent the best available estimates.³⁷ The Executive Order does not preclude agencies from using the same range of estimates as developed by the IWG, so long as the agency explains that the data and methodology that produced those estimates are consistent with Circular A-4 and, more broadly, with standards for rational decisionmaking.

Similarly, the Executive Order’s withdrawal of the CEQ guidance on greenhouse gases does not—and legally cannot—remove agencies’ statutory requirement to fully disclose the environmental impacts of greenhouse gas emissions. As CEQ explained in its withdrawal, the “guidance was not a regulation,” and “[t]he withdrawal of the guidance does not change any law, regulation, or other legally binding requirement.”³⁸ In other words, when the guidance originally recommended the appropriate use of the

³² 538 F.3d at 1199.

³³ While the regulations promulgated by the Council on Environmental Quality to implement NEPA do not require a “monetary cost-benefit analysis,” 40 C.F.R. § 1502.23, monetization nevertheless remains an available tool for contextualizing information. As the Council on Environmental Quality has explained, monetization may be “appropriate and relevant” and, in particular, “the Federal social cost of carbon . . . provides a harmonized, interagency metric that can give decision makers and the public useful information for their NEPA review.” CEQ, *Final Guidance on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in National Environmental Policy Act Reviews* 32-33 & fn.86 (2016), available at https://obamawhitehouse.archives.gov/sites/whitehouse.gov/files/documents/nepa_final_ghg_guidance.pdf.

³⁴ Exec. Order. No. 13,783 § 5(b), 82 Fed. Reg. 16,093 (Mar. 28, 2017).

³⁵ *Id.* § 5(c).

³⁶ OMB, Circular A-4 at 27 (2003) (“You should monetize quantitative estimates whenever possible.”).

³⁷ Richard L. Revesz et al., *Best Cost Estimate of Greenhouse Gases*, 357 SCIENCE 6352 (2017) (explaining that, even after Trump’s Executive Order, the social cost of greenhouse gas estimate of around \$50 per ton of carbon dioxide is still the best estimate).

³⁸ 82 Fed. Reg. 16,576, 16,576 (Apr. 5, 2017).

CO8-1

social cost of greenhouse gases in environmental impact statements,³⁹ it was simply explaining that the social cost of greenhouse gases is consistent with longstanding NEPA regulations and case law, all of which are still in effect today.

As explained in the final sections of these comments, the IWG's estimates of the social cost of greenhouse gases are, in fact, already consistent with the Circular A-4 and represent the best existing estimates of the lower bound of the range for the social cost of greenhouse gases. Therefore, the IWG estimates or those of a similar or higher value⁴⁰ should be used in regulatory analyses and environmental impact statements.

2. The Social Cost of Greenhouse Gas Metric Is Appropriate for a Project-Level EIS with Emissions of this Magnitude

Although FERC admits that operations emissions would contribute to climate change, the Commission claims that because it "[t]here is no standard methodology to determine how the Project's incremental contribution to GHGs would translate into physical effects on the global environment . . . [or] whether or not the Project's contribution to cumulative impacts on climate change would be significant."⁴¹ This same spurious argument was made in the Sabal Trail remand order. One dissenting opinion to that order, from Commissioner LaFleur,⁴² rejects the Commission's claims that it is unable to determine the significance of greenhouse gas emissions.

Despite FERC's claims in the Sabal Trail remand order that the social cost of greenhouse gases only apply to rulemakings,⁴³ the social cost of greenhouse gas methodology is well suited to measure the marginal climate damages of individual projects. These protocols were developed to assess the cost of actions with "marginal" impacts on cumulative global emissions, and the metrics estimate the dollar figure of damages for one extra unit of greenhouse gas emissions. This marginal cost is calculated using integrated assessment models. These models translate emissions into changes in atmospheric greenhouse concentrations, atmospheric concentrations into changes in temperature, and changes in temperature into economic damages. A range of plausible socio-economic and emissions trajectories are used to account for the scope of potential scenarios and circumstances that may actually result in

³⁹ See CEQ, *Revised Draft Guidance on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in National Environmental Policy Act Reviews* at 16 (Dec. 2014), available at https://obamawhitehouse.archives.gov/sites/default/files/docs/nepa_revised_draft_ghg_guidance_searchable.pdf ("When an agency determines it appropriate to monetize costs and benefits, then, although developed specifically for regulatory impact analyses, the Federal social cost of carbon, which multiple Federal agencies have developed and used to assess the costs and benefits of alternatives in rulemakings, offers a harmonized, interagency metric that can provide decisionmakers and the public with some context for meaningful NEPA review. When using the Federal social cost of carbon, the agency should disclose the fact that these estimates vary over time, are associated with different discount rates and risks, and are intended to be updated as scientific and economic understanding improves."); see also CEQ, *Final Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in National Environmental Policy Act Reviews* at 33 n.86 (Aug. 2016), available at https://obamawhitehouse.archives.gov/sites/whitehouse.gov/files/documents/nepa_final_ghg_guidance.pdf.

⁴⁰ See, e.g., Richard L. Revesz et al., *Global Warming: Improve Economic Models of Climate Change*, 508 NATURE 173 (2014) (explaining that current estimates omit key damage categories and, therefore, are very likely underestimates).

⁴¹ DEIS at ES-17.

⁴² Sabal Trail Remand Order, Comm'r LaFleur dissent at 2. See also Comm'r LaFleur, dissenting in part, at 4 (SCC "is a scientifically-derived tool to translate tonnage of carbon dioxide or other GHGs to the cost of long-term climate harm... [W]e are able to estimate what the long-term consequence of a ton of carbon dioxide emissions is likely to be, by use of the Social Cost of Carbon tool."); Comm'r Glick dissent at 8 ("[T]he output from the Social Cost of Carbon tool can serve as an indicator of the climate change impacts ... informing the overall qualitative evaluation under NEPA as well as the public interest balancing under the NGA"; rejecting this tool on grounds that FERC has no basis for determining significance is arbitrary and capricious.).

⁴³ *Id.* at 491.

CO8-1

the coming years and decades. The marginal cost is attained by first running the models using a baseline emissions trajectory, and then running the same models again with one additional unit of emissions. The difference in damages between the two runs is the marginal cost of one additional unit. The approach assumes that the marginal damages from increased emissions will remain constant for small emissions increases relative to gross global emissions. In other words, the monetization tools are in fact perfectly suited to measuring the marginal effects of individual projects or other discrete agency actions.

The Tons of Greenhouse Gas Emissions at Stake Here Are Clearly Significant

FERC quantifies the operational emissions from this project could reach over 8 million metric tons per year. But FERC refuses to take the straightforward next step of applying the social cost of greenhouse gas values to those quantified tons. In the DEIS, FERC implies that it does not monetize the effects of the project's downstream emissions because it is not possible to attribute significance to a single project's emissions.⁴⁴

While there may not be a bright-line test for significance, the emissions FERC estimates for this project are clearly significant and warrant monetization. This is especially true since, once emissions have been quantified, the additional step of monetization through application of the Interagency Working Group's 2016 estimates entails a simple arithmetic calculation.⁴⁵ Importantly, members of the Commission have recently made clear that "the Commission must take a 'hard look' at climate change – the ultimate environmental impact."⁴⁶ FERC Commissioner Glick, in his dissenting opinion to the Sabal Trail Pipeline remand order, states that "[c]limate change is the single most significant threat to humanity, fundamentally threatening our environment, economy, national security and human health. It is difficult to understand how NEPA's demand that an agency take a 'hard look' at the environmental impacts of its actions can be satisfied if the impacts of GHG emissions are ignored."⁴⁷

In *High Country*, the District Court for the District of Colorado found that it was arbitrary for the Forest Service not to monetize the "1.23 million tons of carbon dioxide equivalent emissions [from methane] the West Elk mine emits annually."⁴⁸ That suggests a threshold for monetization far below what FERC estimates here. In *MEIC v. OSM*, the District Court for the District of Montana found it was arbitrary for the Office of Surface Mining not to monetize the 23.16 million metric tons, which constituted "approximately 0.35 percent of the total U.S. emissions."⁴⁹ In *Center for Biological Diversity*, the Ninth Circuit found that it was arbitrary for the Department of Transportation not to monetize the 35 million metric ton difference in lifetime emissions from increasing the fuel efficiency of motor vehicles:⁵⁰ given the estimated lifetime of vehicles sold in the years 2008-2011 (sometimes estimated at about 15 years on average), this could represent as little two million metric tons per year. In a recent environmental impact statement from the Bureau of Ocean Energy Management published in August 2017, the agency explained that the social cost of carbon was "a useful measure" to apply to a NEPA analysis of an action anticipated to have a difference in greenhouse gas emissions compared to the no-action baseline of about 25 million metric tons over a 5-year period,⁵¹ or about 5 million metric tons per year.

⁴⁴ DEIS at 5-22.

⁴⁵ Agencies simply need to multiply their estimate of tons in each year by the IWG's 2016 values for the corresponding year of emissions (adjusted for inflation to current dollars). If the emissions change occurs in the future, agencies would then discount the products back to present value.

⁴⁶ Comm'r Glick, dissenting, at 5.

⁴⁷ Sabal Trail Remand Order, Glick Opinion at 3.

⁴⁸ 52 F. Supp. 3d at 1191 (quoting an e-mail comment on the draft statement for the quantification of tons).

⁴⁹ *MEIC v. Office of Surface Mining* at 36-37.

⁵⁰ 538 F.3d at 1187.

⁵¹ BOEM, *Liberty Development and Production Plan Draft EIS* at 3-129, 4,50 (2017) (89,940,000 minus 64,570,000 is about 25 million).

CO8-1

FERC's estimates of direct emissions from this project's operations and construction alone are comparable to those above cases where monetization of emissions has been found useful or legally required. FERC does not estimate the indirect greenhouse gas emissions from ultimate combustion of the gas liquefied through this project. The project's upstream and downstream emissions will also be highly significant and should also be quantified and monetized. Yet even without counting any indirect emissions, the direct emissions alone warrant monetization.

Under any reasonable application of the social cost of greenhouse gas metrics, the emissions from the Project will cause hundreds of millions of dollars in climate damages. Tellingly, FERC had no problem concluding in its DEIS that it was appropriate to monetize, for example, the \$4.6 million in sales tax revenue (in addition to millions of dollars of other monetized economic benefits).⁵² A potential climate cost of hundreds of millions of dollars is also significant, particularly in the context of a document the very purpose of which is to evaluate a project's *environmental* impacts.

3. FERC Must Use Current Estimates of the Social Cost of Greenhouse Gases That Reflect the Best Available Data and Methodologies

As explained above, FERC is required to monetize the climate effects of the increased greenhouse gas emissions predicted to occur under the project. When FERC monetizes those climate effects, it must use estimates of the social cost of carbon and social cost of methane that reflect the best available data and methodologies.

In 2016, the IWG published updated central estimates for the social cost of greenhouse gases: \$50 per ton of carbon dioxide, \$1440 per ton of methane, and \$18,000 per ton of nitrous oxide (in 2017 dollars for year 2020 emissions).⁵³ Agencies must continue to use estimates of a similar or higher value⁵⁴ in their regulatory analyses and environmental impact statements. In particular, when estimating the social cost of greenhouse gases, agencies must use multiple peer-reviewed models, a global estimate of climate damages, and a 3% or lower discount rate for the central estimate. These methodological approaches are consistent with NEPA's directive that agencies adopt a global perspective and consider the effects of their actions on future generations.

This section discusses the appropriate use of models, the need to use a global estimate of climate damages, and the proper treatment of uncertainty. The need to use a 3% or lower discount rate for the central estimate is discussed in the section above.

Agencies Must Not Rely on a Single Model, but Must Use Multiple, Peer-Reviewed Models

NEPA requires "scientific accuracy" in environmental impact statements, and agencies must "insure the professional integrity, including scientific integrity, of the discussions and analyses."⁵⁵ As the U.S. Court of Appeals for the Tenth Circuit has explained, NEPA requires agencies to use "the best available scientific information."⁵⁶ OMB's *Circular A-4* provides helpful guidance on the standards for accuracy in monetizing costs and benefits. *Circular A-4* requires agencies to use "the best reasonably obtainable

⁵² DEIS at 4-214.

⁵³ U.S. Interagency Working Group on the Social Cost of Greenhouse Gases, "Technical support document: Technical update of the social cost of carbon for regulatory impact analysis under executive order 12866 & Addendum: Application of the methodology to estimate the social cost of methane and the social cost of nitrous oxide" (2016), available at <https://obamawhitehouse.archives.gov/omb/oira/social-cost-of-carbon>.

⁵⁴ See, e.g., Richard L. Revesz et al., *Global Warming: Improve Economic Models of Climate Change*, 508 NATURE 173 (2014) (explaining that current estimates omit key damage categories and, therefore, are very likely underestimates).

⁵⁵ 40 C.F.R. § 1502.24.

⁵⁶ *Custer Cty. Action Ass'n v. Garvey*, 256 F.3d 1024, 1034 (10th Cir. 2001).

CO8-1

scientific, technical, and economic information available. To achieve this, you should rely on peer-reviewed literature, where available.⁵⁷

Since the IWG first issued the federal social cost of carbon protocol in 2010, this methodology has relied on the three most cited, most peer-reviewed integrated assessment models (IAMs). These three IAMs—called DICE (the Dynamic Integrated Model of Climate and the Economy⁵⁸), FUND (the Climate Framework for Uncertainty, Negotiation, and Distribution⁵⁹), and PAGE (Policy Analysis of the Greenhouse Effect⁶⁰)—draw on the best available scientific and economic data to link physical impacts to the economic damages of each marginal ton of greenhouse gas emissions. As noted previously, each model translates emissions into changes in atmospheric greenhouse gas concentrations, atmospheric concentrations into temperature changes, and temperature changes into economic damages, which can then be adjusted according to a discount rate. These three models have been combined with inputs derived from peer-reviewed literature on climate sensitivity, socio-economic and emissions trajectories, and discount rates. The results of the three models have been given equal weight in federal agencies' estimates and have been run through statistical techniques like Monte Carlo analysis to account for uncertainty.

In a 2017 report, the National Academies of Sciences (NAS) recommended future improvements to this methodology. Specifically, over the next five years the NAS recommends unbundling the four essential steps in the IAMs into four separate “modules”: a socio-economic and emissions scenario module, a climate change module, an economic damage module, and a discount rate module.⁶¹ Unbundling these four steps into separate modules could allow for easier, more transparent updates to each individual component in order to better reflect the best available science and capture the full range of uncertainty in the literature. These four modules could be built from scratch or drawn from the existing IAMs. Either way, the integrated modular framework envisioned by NAS for the future will require significant time and resource commitments from federal agencies.

In the meantime, the NAS has supported the continued near-term use of the existing social cost of greenhouse gas estimates based on the DICE, FUND, and PAGE models, as used by federal agencies to date.⁶² In short, DICE, FUND, and PAGE continue to represent the state-of-the-art models. The Government Accountability Office found in 2014 that the estimates derived from these models and used by federal agencies are consensus-based, rely on peer-reviewed academic literature, disclose relevant limitations, and are designed to incorporate new information via public comments and updated research.⁶³ In fact, the social cost of greenhouse gas estimates used in federal regulatory proposals and

CO8-1

⁵⁷ OMB, Circular A-4, at 17.

⁵⁸ William D. Nordhaus, *Estimates of the social cost of carbon: concepts and results from the DICE-2013R model and alternative approaches*, 1 JOURNAL OF THE ASSOCIATION OF ENVIRONMENTAL AND RESOURCE ECONOMISTS 1 (2014).

⁵⁹ David Anthoff & Richard S.J. Tol, THE CLIMATE FRAMEWORK FOR UNCERTAINTY, NEGOTIATION AND DISTRIBUTION (FUND), TECHNICAL DESCRIPTION, VERSION 3.6 (2012), available at <http://www.fund-model.org/versions>.

⁶⁰ Chris Hope, *The Marginal Impact of CO₂ from PAGE2002: An Integrated Assessment Model Incorporating the IPCC's Five Reasons for Concern*, 6 INTEGRATED ASSESSMENT J. 19 (2006).

⁶¹ Nat'l Acad. Sci., Eng. & Medicine, *Valuing Climate Damages: Updating Estimates of the Social Cost of Carbon Dioxide 3* (2017) [hereinafter “NAS, Second Report”] (recommending an “integrated modular approach”).

⁶² Specifically, NAS concluded that a near-term update was not necessary or appropriate and the current estimates should continue to be used while future improvements are developed over time. Nat'l Acad. Sci., Eng. & Medicine, *Assessment of Approaches to Updating the Social Cost of Carbon: Phase 1 Report on a Near-Term Update 1* (2016) [hereinafter “NAS, First Report”].

⁶³ Gov't Accountability Office, *Regulatory Impact Analysis: Development of Social Cost of Carbon Estimates* (2014).

EISs have been subject to over 80 distinct public comment periods.⁶⁴ The economics literature confirms that estimates based on these three IAMs remain the best available estimates.⁶⁵ In 2016, the U.S. Court of Appeals for the Seventh Circuit held the estimates used to date by agencies are reasonable.⁶⁶ Just last month, the District of Montana rejected an agency's Environmental Assessment for failure to incorporate the federal social cost of carbon estimates into its cost-benefit analysis of a proposed mine expansion.⁶⁷

Regardless of Executive Order 13,783's withdrawal of the guidance requiring federal agencies to rely on IWG's technical support documents to estimate the social cost of greenhouse gases, IWG's choice of DICE, FUND, and PAGE, its use of inputs and assumptions, and its statistical analysis still represent the state-of-the-art approach based on the best available, peer-reviewed literature. This approach satisfies both NEPA's and Circular A-4's requirements for information quality and transparency. Therefore, in complying with the Executive Order's instructions to ensure that social cost of greenhouse gas estimates are consistent with Circular A-4, agencies will necessarily have to rely on models like DICE, FUND, and PAGE, to use the same or similar inputs and assumptions as the IWG, and to apply statistical analyses like Monte Carlo.

The unavoidable fact is that DICE, FUND, and PAGE are still the dominant, most peer-reviewed models,⁶⁸ and most estimates in the literature continue to rely on those models.⁶⁹ Each of these models has been developed over decades of research, and has been subject to rigorous peer review, documented in the published literature. While other models exist, they lack DICE's, FUND's, and PAGE's long history of peer review or exhibit other limitations. For example, the World Bank has created ENVISAGE, which models a more detailed breakdown of market sectors,⁷⁰ but unfortunately does not account for non-market impacts and so would omit a large portion of significant climate effects. Models like ENVISAGE are therefore not currently appropriate choices under the criteria of Circular A-4.⁷¹

An approach based on multiple, peer-reviewed models (like DICE, FUND, and PAGE) is more rigorous and more consistent with Circular A-4 than reliance on a single model or estimate. DICE, FUND, and PAGE each include many of the most significant climate effects, use appropriate discount rates and other

⁶⁴ Peter Howard & Jason Schwartz, *Think Global: International Reciprocity as Justification for a Global Social Cost of Carbon*, 42 *Columbia J. Envtl. L.* 203 (2017), at Appendix A.

⁶⁵ E.g., Richard G. Newell et al., *Carbon Market Lessons and Global Policy Outlook*, 343 *SCIENCE* 1316 (2014); Bonnie L. Keeler et al., *The Social Costs of Nitrogen*, 2 *SCIENCE ADVANCES* e1600219 (2016); Richard L. Revesz et al., *Global Warming: Improve Economic Models of Climate Change*, 508 *NATURE* 173 (2014) (co-authored with Nobel Laureate Kenneth Arrow, among others).

⁶⁶ *Zero Zone*, 832 F.3d at 679 (7th Cir. 2016) (finding that the agency "acted reasonably" in using global estimates of the social cost of carbon, and that the estimates chosen were not arbitrary or capricious).

⁶⁷ *Montana Envtl. Info. Cent.*, 2017 WL 3480262, at *12-15, 19.

⁶⁸ See Interagency Working Group on the Social Cost of Carbon, *Response to Comments: Social Cost of Carbon for Regulatory Impact Analysis under Executive Order 12,866* at 7 (July 2015) ("DICE, FUND, and PAGE are the most widely used and widely cited models in the economic literature that link physical impacts to economic damages for the purposes of estimating the SCC."), citing Nat'l Acad. Sci., Eng. & Medicine, *Hidden Cost of Energy: Unpriced Consequences of Energy Production and Use* (2010) ("the most widely used impact assessment models").

⁶⁹ R.S. Tol, *The Social Cost of Carbon*, 3 *Annual Rev. Res. Econ.* 419 (2011); T. Havranek et al., *Selective Reporting and the Social Cost of Carbon*, 51 *Energy Econ.* 394 (2015).

⁷⁰ World Bank, *The Environmental Impact and Sustainability Applied General Equilibrium (ENVISAGE) Model* (2008), available at <http://siteresources.worldbank.org/INTPROSPECTS/Resources/334934-1193838209522/Envisage7b.pdf>.

⁷¹ Similarly, Intertemporal Computable Equilibrium System (ICES) does not account for non-market impacts. See <https://www.cmcc.it/models/ices-intertemporal-computable-equilibrium-system>. Other models include CRED, which is worthy of further study for future use. Frank Ackerman, Elizabeth A. Stanton & Ramón Bueno, *CRED: A New Model of Climate and Development*, 85 *ECOLOGICAL ECONOMICS* 166 (2013). Accounting for omitted impacts more generally, E.A. Stanton, F. Ackerman, R. Bueno, *Reason, Empathy, and Fair Play: The Climate Policy Gap*, (Stockholm Environment Inst. Working Paper 2012-02), find a doubling of the SCC using the CRED model.

CO8-1

assumptions, address uncertainty, are based on peer-reviewed data, and are transparent.⁷² However, each IAM also has its own limitations and is sensitive to its own assumptions. No model fully captures all the significant climate effects.⁷³ By giving weight to multiple models—as the IWG did—agencies can balance out some of these limitations and produce more robust estimates.⁷⁴

Finally, while agencies should be careful not to cherry-pick a single estimate from the literature, it is noteworthy that various estimates in the literature are consistent with the numbers derived from a weighted average of DICE, FUND, and PAGE—namely, with a central estimate of about \$40 per ton of carbon dioxide, and a high-percentile estimate of about \$120, for year 2015 emissions (in 2016 dollars, at a 3% discount rate). The latest central estimate from DICE's developers is \$87 (at a 3% discount rate);⁷⁵ from FUND's developers, \$12;⁷⁶ and from PAGE's developers, \$123, with a high-percentile estimate of \$332.⁷⁷

In fact, much of the literature suggests that a central estimate of \$40 per ton is a very conservative *underestimate* of the true social cost of carbon. A 2013 meta-analysis of the broader literature found a mean estimate of \$59 per ton of carbon dioxide,⁷⁸ and a soon-to-be-published update by the same author finds a mean estimate of \$108 (at a 1% discount rate).⁷⁹ A 2015 meta-analysis—which sought out estimates besides just those based on DICE, FUND, and PAGE—found a mean estimate of \$83 per ton of carbon dioxide.⁸⁰ Various studies relying on expert elicitation⁸¹ from a large body of climate economists and scientists have found mean estimates of \$50 per ton of carbon dioxide,⁸² \$96-\$144 per ton of carbon dioxide,⁸³ and \$80-\$100 per ton of carbon dioxide.⁸⁴ There is a growing consensus in the literature that even the best existing estimates of the social cost of greenhouse gases may severely underestimate the true marginal cost of climate damages.⁸⁵ Overall, a central estimate of \$40 per ton of

CO8-1

⁷² While sensitivity analysis can address parametric uncertainty within a model, using multiple models helps address structural uncertainty.

⁷³ See Peter Howard, *Omitted Damages: What's Missing from the Social Cost of Carbon 5* (Cost of Carbon Project Report, 2014), <http://costofcarbon.org/>.

⁷⁴ Moore, F., Baldos, U., & Hertel, T. (2017). Economic impacts of climate change on agriculture: a comparison of process-based and statistical yield models. *Environmental Research Letters*.

⁷⁵ William Nordhaus, *Revisiting the Social Cost of Carbon*, Proc. Nat'l Acad. Sci. (2017) (estimate a range of \$21 to \$141).

⁷⁶ D. Anthoff & R. Tol, *The Uncertainty about the Social Cost of Carbon: A Decomposition Analysis Using FUND*, 177 *Climatic Change* 515 (2013).

⁷⁷ C. Hope, *The social cost of CO2 from the PAGE09 model*, 39 *Economics* (2011); C. Hope, *Critical issues for the calculation of the social cost of CO2*, 117 *Climatic Change*, 531 (2013).

⁷⁸ R. Tol, *Targets for Global Climate Policy: An Overview*, 37 *J. Econ. Dynamics & Control* 911 (2013).

⁷⁹ R. Tol, *Economic Impacts of Climate Change* (Univ. Sussex Working Paper No. 75-2015, 2015).

⁸⁰ S. Nocera et al., *The Economic Impact of Greenhouse Gas Abatement through a Meta-Analysis: Valuation, Consequences and Implications in terms of Transport Policy*, 37 *Transport Policy* 31 (2015).

⁸¹ Circular A-4, at 41, supports use of expert elicitation as a valuable tool to fill gaps in knowledge.

⁸² Scott Holladay & Jason Schwartz, *Economists and Climate Change* 43 (Inst. Policy Integrity Brief, 2009 (directly surveying experts about the SCC)).

⁸³ Peter Howard & Derek Sylvan, *The Economic Climate: Establishing Expert Consensus on the Economics of Climate Change* (Inst. Policy Integrity Working Paper 2015/1) (using survey results to calibrate the DICE-2013R damage function).

⁸⁴ R. Pindyck, *The Social Cost of Carbon Revisited* (Nat'l Bureau of Econ. Res. No. w22807, 2016) (\$80-\$100 is the trimmed range of estimates at a 4% discount rate; without trimming of outlier responses, the estimate is \$200).

⁸⁵ E.g., Howard & Sylvan, *supra* note 83; Pindyck, *supra* note 84. The underestimation results from a variety of factors, including omitted and outdated climate impacts (including ignoring impacts to economic growth and tipping points), simplified utility functions (including ignoring relative prices), and applying constant instead of a declining discount rate. See Howard, *supra* note 73; Revesz et al., *supra* note 65; J.C. Van Den Bergh & W.J. Botzen, *A Lower Bound to the Social Cost of CO2 Emissions*, 4 *Nature Climate Change* 253 (2014) (proposing \$125 per metric ton of carbon dioxide in 1995 dollars, or about \$200 in today's dollars, as the lower bound estimate). See also F.C. Moore & D.B. Diaz, *Temperature Impacts on Economic Growth Warrant Stringent Mitigation Policy*, 5 *Nature Climate Change* 127 (2015) (concluding the SCC may be six times higher after

carbon dioxide at a 3% discount rate, with a high-percentile estimate of about \$120 for year 2015 emissions, is consistent with the best available literature; if anything, the best available literature supports considerably higher estimates.⁸⁶

Similarly, a comparison of international estimates of the social cost of greenhouse gases suggests that a central estimate of \$40 per ton of carbon dioxide is a very conservative value. Sweden places the long-term valuation of carbon dioxide at \$168 per ton; Germany calculates a “climate cost” of \$167 per ton of carbon dioxide in the year 2030; the United Kingdom’s “shadow price of carbon” has a central value of \$115 by 2030; Norway’s social cost of carbon is valued at \$104 per ton for year 2030 emissions; and various corporations have adopted internal shadow prices as high as \$80 per ton of carbon dioxide.⁸⁷

Indeed, a number of our organizations have previously commented on ways in which the IWG’s approach could be improved to more accurately reflect the true social cost of greenhouse gases. For instance, the IWG’s values should reflect risk aversion and account for the additional price that society is willing to pay to avoid uncertainty around increasingly more severe impacts from climate change.⁸⁸ In addition, noted Harvard economist Martin Weitzmann has observed, the three IAMs assume a relatively smooth upward slope in economic damages even as global climates increase well past critical tipping points. An improved social cost of greenhouse gases could reflect modified damage functions that better address tipping points.⁸⁹

For these reasons, the IWG’s estimates are very likely to underrepresent the true impact that greenhouse gas emissions have on society, and we strongly encourage further efforts to make those efforts more robust. Nevertheless, the IWG’s approach represents the best and most rigorous effort that the U.S. government has engaged in thus far to realistically estimate the social cost of greenhouse gases. As such, agencies must incorporate those values into their rulemaking analyses; simply refusing to monetize the greenhouse gas emissions of their actions, as FERC has done in this case, does not pass legal or technical muster.

A Global Estimate of Climate Damages Is Required by NEPA

NEPA contains a provision on “International and National Coordination of Efforts” that broadly requires that “all agencies of the Federal Government shall . . . recognize the worldwide and long-range character of environmental problems.”⁹⁰ Using a global social cost of greenhouse gases to analyze and set policy fulfills these instructions. Furthermore, the Act requires agencies to, “where consistent with the foreign policy of the United States, lend appropriate support to initiatives, resolutions, and programs designed to maximize international cooperation in anticipating and preventing a decline in the quality of

accounting for potential growth impacts of climate change). Accounting for both potential impacts of climate change on economic growth and other omitted impacts, S. Dietz and N. Stern find a two- to seven-fold increase in the SCC. *Endogenous growth, convexity of damage and climate risk: how Nordhaus’ framework supports deep cuts in carbon emissions*. 125 *The Economic Journal* 574 (2015).

⁸⁶ Note that the various estimates cited in the paragraph have not all been converted to standard 2017\$, and may not all reflect the same year emissions. Nevertheless, the magnitude of this range suggests that \$40 per ton of year 2015 emissions is a conservative estimate.

⁸⁷ See Howard & Schwartz, *supra* note 64, at Appendix B. All these estimates are in 2016\$.

⁸⁸ See, e.g., Howarth, R. B., Gerst, M. D., & Borsuk, M. E., 2014. *Risk mitigation and the social cost of carbon*. *Global Environmental Change* 24, 123-131.

⁸⁹ Weitzmann, M.L., *GHG Targets as Insurance Against Catastrophic Climate Damages*, National Bureau of Economic Research Working Paper No. 16136, 12-16 (2010).

⁹⁰ 42 U.S.C. § 4332(2)(f) (emphasis added).

CO8-1

mankind's world environment."⁹¹ By continuing to use the global social cost of greenhouse gases to spur reciprocal foreign actions, federal agencies "lend appropriate support" to the NEPA's goal of "maximize[ing] international cooperation" to protect "mankind's world environment." Furthermore, not only is it consistent with Circular A-4 and best economic practices to estimate the global damages of U.S. greenhouse gas emissions in regulatory analyses and environmental impact statements, but no existing methodology for estimating a "domestic-only" value is reliable, complete, or consistent with Circular A-4.

From 2010 through 2016, federal agencies based their regulatory decision and NEPA reviews on global estimates of the social cost of greenhouse gases. Though agencies often also disclosed a "highly speculative" range that tried to capture exclusively U.S. climate costs, emphasis on a global value was recognized as more accurate given the science and economics of climate change, as more consistent with best economic practices, and as crucial to advancing U.S. strategic goals.⁹²

Opponents of climate regulation challenged the global number in court and other forums, and often attempted to use Circular A-4 as support.⁹³ Specifically, opponents have seized on Circular A-4's instructions to "focus" on effects to "citizens and residents of the United States," while any significant effects occurring "beyond the borders of the United States . . . should be reported separately."⁹⁴ Importantly, despite this language and such challenges, the U.S. Court of Appeals for the Seventh Circuit had no trouble concluding that a global focus for the social cost of greenhouse gases was reasonable:

AHRI and Zero Zone [the industry petitioners] next contend that DOE [the Department of Energy] arbitrarily considered the global benefits to the environment but only considered the national costs. They emphasize that the [statute] only concerns "national energy and water conservation." In the New Standards Rule, DOE did not let this submission go unanswered. It explained that climate change "involves a global externality," meaning that carbon released in the United States affects the climate of the entire world. According to DOE, national energy conservation has global effects, and, therefore, those global effects are an appropriate consideration when looking at a national policy. Further, AHRI and Zero Zone point to no global costs that should have been considered alongside these benefits. Therefore, DOE acted reasonably when it compared global benefits to national costs.⁹⁵

Circular A-4's reference to effects "beyond the borders" confirms that it is appropriate for agencies to consider the global effects of U.S. greenhouse gas emissions. While Circular A-4 may suggest that most

⁹¹ *Id.*; see also *Environmental Defense Fund v. Massey*, 986 F.2d 528, 535 (D.C. Cir. 1993) (confirming that Subsection F is mandatory); *Natural Resources Defense Council v. NRC*, 647 F.2d 1345, 1357 (D.C. Cir. 1981) ("This NEPA prescription, I find, looks toward cooperation, not unilateral action, in a manner consistent with our foreign policy."); cf. COUNCIL ON ENVIRONMENTAL QUALITY, GUIDANCE ON NEPA ANALYSIS FOR TRANSBOUNDARY IMPACTS (1997), available at <http://www.gc.noaa.gov/documents/transguide.pdf>; Exec. Order No. 12,114, *Environmental Effects Abroad of Major Federal Actions*, 44 Fed. Reg. 1957 §§ 1-1, 2-1 (Jan. 4, 1979) (applying to "major Federal actions . . . having significant effects on the environment outside the geographical borders of the United States," and enabling agency officials "to be informed of pertinent environmental considerations and to take such considerations into account . . . in making decisions regarding such actions").

⁹² See generally Howard & Schwartz, *supra* note 64.

⁹³ Ted Gayer & W. Kip Viscusi, *Determining the Proper Scope of Climate Change Policy Benefits in U.S. Regulatory Analyses: Domestic versus Global Approaches*, 10 Rev. Envtl. Econ. & Pol'y 245 (2016) (citing Circular A-4 to argue against a global perspective on the social cost of carbon); see also, e.g., Petitioners Brief on Procedural and Record-Based Issues at 70, in *West Virginia v. EPA*, case 15-1363, D.C. Cir. (filed February 19, 2016) (challenging EPA's use of the global social cost of carbon).

⁹⁴ Circular A-4 at 15. Note that A-4 slightly conflates "accrue to citizens" with "borders of the United States": U.S. citizens have financial and other interests tied to effects beyond the borders of the United States, as discussed further below.

⁹⁵ *Zero Zone v. Dept. of Energy*, 832 F.3d 654, 679 (7th Cir. 2016),

CO8-1

typical decisions should focus on U.S. effects, the Circular cautions agencies that special cases call for different emphases:

[Y]ou cannot conduct a good regulatory analysis according to a formula. Conducting high-quality analysis requires competent professional judgment. ***Different regulations may call for different emphases*** in the analysis, ***depending on the nature and complexity*** of the regulatory issues and the sensitivity of the benefit and cost estimates to the key assumptions.⁹⁶

In fact, Circular A-4 elsewhere assumes that agencies' analyses will not always be conducted from purely the perspective of the United States, as one of its instructions only applies "as long as the analysis is conducted from the United States perspective,"⁹⁷ suggesting that in some circumstances it is appropriate for the analysis to be global. For example, EPA and DOT have adopted a global perspective on the analysis of potential monopsony benefits to U.S. consumers resulting from the reduced price of foreign oil imports following energy efficiency increases, and EPA assesses the global potential for leakage of greenhouse gas emissions owing to U.S. regulation.⁹⁸

Perhaps more than any other issue, the nature of the issue of climate change requires precisely such a "different emphasis" from the default domestic-only assumption. To avoid a global "tragedy of the commons" that could irreparably damage all countries, including the United States, every nation should ideally set policy according to the global social cost of greenhouse gases.⁹⁹ Climate and clean air are global common resources, meaning they are freely available to all countries, but any one country's use—i.e., pollution—imposes harms on the polluting country as well as the rest of the world. Because greenhouse pollution does not stay within geographic borders but rather mixes in the atmosphere and affects climate worldwide, each ton emitted by the United States not only creates domestic harms, but also imposes large externalities on the rest of the world. Conversely, each ton of greenhouse gases abated in another country benefits the United States along with the rest of the world.

If all countries set their greenhouse emission levels based on only domestic costs and benefits, ignoring the large global externalities, the aggregate result would be substantially sub-optimal climate protections and significantly increased risks of severe harms to all nations, including the United States. Thus, basic economic principles demonstrate that the United States stands to benefit greatly if all countries apply global social cost of greenhouse gas values in their regulatory decisions and project reviews. Indeed, the United States stands to gain hundreds of billions or even trillions of dollars in direct benefits from efficient foreign action on climate change.¹⁰⁰

In order to ensure that other nations continue to use global social cost of greenhouse gas values, it is important that the United States itself continue to do so.¹⁰¹ The United States is engaged in a repeated strategic dynamic with several significant players—including the United Kingdom, Germany, Sweden, and others—that have already adopted a global framework for valuing the social cost of greenhouse

⁹⁶ Circular A-4 at 3 (emphasis added).

⁹⁷ *Id.* at 38 (counting international transfers as costs and benefits "as long as the analysis is conducted from the United States perspective").

⁹⁸ See Howard & Schwartz, *supra* note 64, at 268-69.

⁹⁹ See Garrett Hardin, *The Tragedy of the Commons*, 162 *Science* 1243 (1968) ("[E]ach pursuing [only its] own best interest . . . in a commons brings ruin to all.").

¹⁰⁰ Policy Integrity, *Foreign Action, Domestic Windfall: The U.S. Economy Stands to Gain Trillions from Foreign Climate Action* (2015), <http://policyintegrity.org/files/publications/ForeignActionDomesticWindfall.pdf>

¹⁰¹ See Robert Axelrod, *The Evolution of Cooperation* 10-11 (1984) (on repeated prisoner's dilemma games).

CO8-1

gases.¹⁰² For example, Canada and Mexico have explicitly borrowed the IWG’s global SCC metric to set their own fuel efficiency standards.¹⁰³ For the United States to now depart from this collaborative dynamic by reverting to a domestic-only estimate would undermine the country’s long-term interests and could jeopardize emissions reductions underway in other countries, which are already benefiting the United States.

For these and other reasons, the IWG properly relied on global estimates to develop its SCC metric, and many federal agencies have since relied on this global metric to evaluate and justify their decisions. At the same time, some agencies have, in addition to the global estimate, also disclosed a “highly speculative” estimate of the domestic-only effects of climate change. In particular, the Department of Energy always includes a chapter on a domestic-only value of carbon emissions in the economic analyses supporting its energy efficiency standards; EPA has also often disclosed similar estimates.¹⁰⁴ Such an approach is consistent with Circular A-4’s suggestion that agencies should usually disclose domestic effects separately from global effects. However, as we have discussed, reliance on a domestic-only methodology would be inconsistent with both the inherent nature of climate change and the standards of Circular A-4. Consequently, it is appropriate under Circular A-4 for agencies to continue to rely on global estimates of the social cost of greenhouses to justify their regulatory decisions or their choice of alternatives under NEPA.

Moreover, no current methodology can accurately estimate a “domestic-only” value of the social cost of greenhouse gases. OMB, the National Academies of Sciences, and the economic literature all agree that existing methodologies for calculating a “domestic-only” value of the social cost of greenhouse gases are deeply flawed and result in severe and misleading underestimates. In developing the social cost of carbon, the IWG did offer some such domestic estimates. Using the results of one economic model (FUND) as well as the U.S. share of global gross domestic product (GDP), the group generated an “approximate, provisional, and *highly speculative*” range of 7–23% of the global social cost of carbon as an estimate of the purely direct climate effects to the United States.¹⁰⁵ Yet, as the IWG itself acknowledged, this range is almost certainly an underestimate because it ignores significant, indirect costs to trade, human health, and security that are likely to “spill over” into the United States as other regions experience climate change damages, among other effects.¹⁰⁶

Neither the existing IAMs nor a share of global GDP are appropriate bases for calculating a domestic-only estimate. The IAMs were never designed to calculate a domestic SCC, since a global SCC is the economic efficient value. FUND, like other IAMs, includes some simplifying assumptions: of relevance, FUND and the other IAMs are not able to capture the adverse effects that the impacts of climate change in other countries will have on the United States through trade linkages, national security, migration,

CO8-1

¹⁰² See Howard & Schwartz, *supra* note 64, at Appendix B.

¹⁰³ See Heavy-Duty Vehicle and Engine Greenhouse Gas Emission Regulations, SOR/2013-24, 147 Can. Gazette pt. II, 450, 544 (Can.), available at <http://canadagazette.gc.ca/rp-pr/p2/2013/2013-03-13/html/sor-dors24-eng.html> (“The values used by Environment Canada are based on the extensive work of the U.S. Interagency Working Group on the Social Cost of Carbon.”); Jason Furman & Brian Deese, *The Economic Benefits of a 50 Percent Target for Clean Energy Generation by 2025*, White House Blog, June 29, 2016 (summarizing the North American Leader’s Summit announcement that U.S., Canada, and Mexico would “align” their SCC estimates).

¹⁰⁴ Howard & Schwartz, *supra* note 64, at 220-21.

¹⁰⁵ INTERAGENCY WORKING GROUP ON SOCIAL COST OF CARBON, TECHNICAL SUPPORT DOCUMENT: SOCIAL COST OF CARBON FOR REGULATORY IMPACT ANALYSIS UNDER EXECUTIVE ORDER 12,866 at 11 (2010) (emphasis added).

¹⁰⁶ *Id.* (explaining that the IAMs, like FUND, do “not account for how damages in other regions could affect the United States (e.g., global migration, economic and political destabilization”).

and other forces.¹⁰⁷ This is why the IWG characterized the domestic-only estimate from FUND as a “highly speculative” underestimate. Similarly, a domestic-only estimate based on some rigid conception of geographic borders or U.S. share of world GDP will fail to capture all the climate-related costs and benefits that matter to U.S. citizens.¹⁰⁸ U.S. citizens have economic and other interests abroad that are not fully reflected in the U.S. share of global GDP. GDP is a “monetary value of final goods and services—that is, those that are bought by the final user—produced in a country in a given period of time.”¹⁰⁹ GDP therefore does not reflect significant U.S. ownership interests in foreign businesses, properties, and other assets, as well as consumption abroad including tourism,¹¹⁰ or even the 8 million Americans living abroad.¹¹¹ At the same time, GDP is also over-inclusive, counting productive operations in the United States that are owned by foreigners. Gross National Income (GNI), by contrast, defines its scope not by location but by ownership interests.¹¹² However, not only has GNI fallen out of favor as a metric used in international economic policy,¹¹³ but using a domestic-only SCC based on GNI would make the SCC metrics incommensurable with other costs in regulatory impact analyses, since most regulatory costs are calculated by U.S. agencies regardless of whether they fall to U.S.-owned entities or to foreign-owned entities operating in the United States.¹¹⁴ Furthermore, both GDP and GNI are dependent on what happens in other countries, due to trade and the international flow of capital. The artificial constraints of both metrics counsel against a rigid split based on either U.S. GDP or U.S. GNI.¹¹⁵

Of course, there already are and will continue to be significant, quantifiable, localized effects of climate change. For example, a peer-reviewed EPA report, *Climate Change in the United States: Benefits of Global Action*, found that by the end of the century, the U.S. economy could face damages of \$110 billion annually in lost labor productivity alone due to extreme temperatures, plus \$11 billion annually in agricultural damages, \$180 billion in losses to key economic sectors due to water shortages, and \$5 trillion in damages U.S. coastal property.¹¹⁶ But the existence of those examples of quantifiable estimates of localized damages does not mean that the current IAMs are able to extrapolate a U.S.-only

CO8-1

¹⁰⁷ See, e.g., Dept. of Defense, *National Security Implications of Climate-Related Risks and a Changing Climate* (2015), available at <http://archive.defense.gov/pubs/150724-congressional-report-on-national-implications-of-climate-change.pdf?source=govdelivery>.

¹⁰⁸ A domestic-only SCC would fail to “provide to the public and to OMB a careful and transparent analysis of the anticipated consequences of economically significant regulatory actions.” Office of Information and Regulatory Affairs, *Regulatory Impact Analysis: A Primer 2* (2011).

¹⁰⁹ Tim Callen, *Gross Domestic Product: An Economy’s All*, IMF, <http://www.imf.org/external/pubs/ft/fandd/basics/gdp.htm> (last updated Mar. 28, 2012).

¹¹⁰ “U.S. residents spend millions each year on foreign travel, including travel to places that are at substantial risk from climate change, such as European cities like Venice and tropical destinations like the Caribbean islands.” David A. Dana, *Valuing Foreign Lives and Civilizations in Cost-Benefit Analysis: The Case of the United States and Climate Change Policy* (Northwestern Faculty Working Paper 196, 2009), <http://scholarlycommons.law.northwestern.edu/cgi/viewcontent.cgi?article=1195&context=facultyworkingpapers>.

¹¹¹ Assoc. of Americans Resident Overseas, <https://www.aaro.org/about-aaro/6m-americans-abroad>. Admittedly 8 million is only 0.1% of the total population living outside the United States.

¹¹² *GNI, Atlas Method (Current US\$)*, THE WORLD BANK, <http://data.worldbank.org/indicator/NY.GNP.ATLS.CD>.

¹¹³ *Id.*

¹¹⁴ U.S. Office of Management and Budget & Secretariat General of the European Commission, *Review of Application of EU and US Regulatory Impact Assessment Guidelines on the Analysis of Impacts on International Trade and Development* 13 (2008).

¹¹⁵ Advanced Notice of Proposed Rulemaking on Regulating Greenhouse Gas Emissions Under the Clean Air Act, 73 Fed. Reg. 44,354, 44,415 (July 30, 2008) (“Furthermore, international effects of climate change may also affect domestic benefits directly and indirectly to the extent U.S. citizens value international impacts (e.g., for tourism reasons, concerns for the existence of ecosystems, and/or concern for others); U.S. international interests are affected (e.g., risks to U.S. national security, or the U.S. economy from potential disruptions in other nations).”).

¹¹⁶ EPA, *Climate Change in the United States: Benefits of Global Action* (2015).

number that accurately reflects total domestic damages—especially since, as already explained, the IAMs do not reflect spill overs.

As a result, in 2015, OMB concluded, along with several other agencies, that “good methodologies for estimating domestic damages do not currently exist.”¹¹⁷ Similarly, the NAS recently concluded that current IAMs cannot accurately estimate the domestic social cost of greenhouse gases, and that estimates based on U.S. share of global GDP would be likewise insufficient.¹¹⁸ William Nordhaus, the developer of the DICE model, cautioned earlier this year that “regional damage estimates are both incomplete and poorly understood,” and “there is little agreement on the distribution of the SCC by region.”¹¹⁹ In short, any domestic-only estimate will be inaccurate, misleading, and out of step with the best available economic literature, in violation of Circular A-4’s standards for information quality.

For more details on the justification for a global value of the social cost of greenhouse gases, please see Peter Howard & Jason Schwartz, *Think Global: International Reciprocity as Justification for a Global Social Cost of Carbon*, 42 Columbia J. Envtl. L. 203 (2017). Another strong defense of the global valuation as consistent with best economic practices appears in a letter published in a recent issue of *The Review of Environmental Economics and Policy*, co-authored by the late Nobel laureate economist Kenneth Arrow.¹²⁰

There Is Clear Consensus on Using a 3% or Lower (or Declining) Discount Rate as a Central Estimate

In the Southeast Market Pipeline draft supplemental EIS, which this group commented on last year, FERC cites a 2013 EPA factsheet for the proposition that there is such a lack of consensus around the appropriate discount rate that the resulting range of estimates of the social cost of greenhouse gases is too wide to be helpful.¹²¹ Not only was this line of thinking rejected by the Ninth Circuit in *Center for Biological Diversity*—“while . . . there is a range of values, the value of carbon emissions reduction is certainly not zero”¹²²—but the range of values recommended by the Interagency Working Group¹²³ and endorsed by the National Academies of Sciences¹²⁴ is rather manageable. In 2016, the IWG recommended values at discount rates from 2.5% to 5%, calculated as between \$12 and \$62 for year 2020 emissions.¹²⁵ Numerous federal agencies have had no difficulty either applying this range in their

CO8-1

¹¹⁷ In November 2013, OMB requested public comments on the social cost of carbon. In 2015, OMB along with the rest of the Interagency Working Group issued a formal response to those comments. Interagency Working Group on the Social Cost of Carbon, *Response to Comments: Social Cost of Carbon for Regulatory Impact Analysis under Executive Order 12,866* at 36 (July 2015) [hereinafter, OMB 2015 Response to Comments].

¹¹⁸ NAS Second Report, *supra* note 61, at 53.

¹¹⁹ William Nordhaus, *Revisiting the Social Cost of Carbon*, 114 PNAS 1518, 1522 (2017).

¹²⁰ Richard Revesz, Kenneth Arrow et al., *The Social Cost of Carbon: A Global Imperative*, 11 REEP 172 (2017).

¹²¹ Southeast Market EIS at 5. *But see* Sabal Remand Order (Comm’r LaFleur, dissenting in part) (“[T]he Commission could estimate the appropriate discount rate or to use more than one discount rate in our calculations or to provide a range of numbers for consideration.”); *id.* (Comm’r Glick, dissenting) (“perceived technical challenges including the presence of assumptions or unknowns, such as discount rate, . . . does not diminish the Commission’s responsibility to provide a qualitative assessment, rather the Commission simply must make a disclosure ‘so that readers can take the resulting estimates with the appropriate amount of salt.’”).

¹²² 538 F.3d at 1200.

¹²³ See Interagency Working Group on the Social Cost of Greenhouse Gases, *Technical Update* (2016) (hereinafter 2016 TSD).

¹²⁴ See National Academies of Sciences, *Assessment of Approaches to Updating the Social Cost of Carbon* (2016) (hereinafter First NAS Report) (endorsing continued near-term use of the IWG numbers; in 2017, the NAS recommended moving to a declining discount rate, see National Academies of Sciences, *Valuing Climate Damages* (2017) (hereinafter Second NAS Report).

¹²⁵ 2016 TSD. The values given here are in 2007\$. The IWG also recommended a 95th percentile value of \$123.

environmental impact statements or else focusing on the central estimate at a 3% discount rate.¹²⁶ Most recently, in August 2017, the Bureau of Ocean Energy Management applied the IWG's range of estimates calculated at three discount rates (2.5%, 3%, and 5%) to its environmental impact statement for an offshore oil development plan,¹²⁷ and called this range of estimates "a useful measure to assess the benefits of CO₂ reductions and inform agency decisions."¹²⁸

More importantly, there is widespread consensus that a central estimate calculated at a 3% or lower discount rate, or else using a declining discount rate, is most appropriate, while a 7% discount rate would be wholly inappropriate in the context of intergenerational climate damages. Because of the long lifespan of greenhouse gases and the long-term or irreversible consequences of climate change, the effects of today's emissions changes will stretch out over the next several centuries. The time horizon for an agency's analysis of climate effects, as well as the discount rate applied to future costs and benefits, determines how an agency treats future generations. Current central estimates of the social cost of greenhouse gases are based on a 3% discount rate and a 300-year time horizon. Executive Order 13,783 disbanded the Interagency Working Group in March 2017 and instructs agencies to reconsider the "appropriate discount rates" when monetizing the value of climate effects.¹²⁹ By citing the official guidance on typical regulatory impact analyses (namely, Circular A-4), the Order implicitly called into question the IWG's choice not to use a 7% discount rate. However, use of a 7% discount would not only be inconsistent with best economic practices but would violate NEPA's required consideration of impacts on future generations.

NEPA requires agencies to weigh the "relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity," as well as "any irreversible and irretrievable commitments of resources."¹³⁰ That requirement is prefaced with a congressional declaration of policy that explicitly references the needs of future generations:

The Congress, recognizing the profound impact of man's activity on the interrelations of all components of the natural environment . . . declares that it is the continuing policy of the Federal Government . . . to use all practicable means and measures . . . to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans.¹³¹

When the Congressional Conference Committee adopted that language, it reported that the first "broad national goal" under the statute is to "fulfill the responsibilities of each generation as trustee of the environment for future generations. It is recognized in this [congressional] statement [of policy] that

¹²⁶ BLM, *Envtl. Assessment—Waste Prevention, Prod. Subject to Royalties, and Res. Conservation* at 52 (2016); BLM, *Final Env'tl. Assessment: Little Willow Creek Protective Oil and Gas Lease*, DOI-BLM-ID-B010-2014-0036-EA, at 82 (2015); Office of Surface Mining, *Final Env'tl. Impact Statement—Four Corners Power Plant and Navajo Mine Energy Project* at 4.2-26 to 4.2-27 (2015) (explaining the social cost of greenhouse gases "provide[s] further context and enhance[s] the discussion of climate change impacts in the NEPA analysis."); U.S. Army Corps of Engineers, *Draft Env'tl. Impact Statement for the Missouri River Recovery Mgmt. Project* at 3-335 (2016); U.S. Forest Serv., *Rulemaking for Colorado Roadless Areas: Supplemental Final Env'tl. Impact Statement* at 120-123 (Nov. 2016) (using both the social cost of carbon and social cost of methane relating to coal leases); NHTSA EIS, Available at http://www.nhtsa.gov/staticfiles/rulemaking/pdf/cale/FINAL_EIS.pdf at 9-77.

¹²⁷ BOEM, *Liberty Development Project: Draft Environmental Impact Statement*, at 4-247 (2017).

¹²⁸ *Id.* at 3-129.

¹²⁹ Executive Order 13,783 § 5(c).

¹³⁰ 42 U.S.C. § 4332(2)(C).

¹³¹ 42 U.S.C.A. § 4331.

CO8-1

each generation has a responsibility to improve, enhance, and maintain the quality of the environment *to the greatest extent possible for the continued benefit of future generations.*¹³²

Because applying a 7% discount rate to the social cost of greenhouse gases could drop the valuation essentially to \$0, use of such a rate effectively ignores the needs of future generations. Doing so would arbitrarily fail to consider an important statutory factor that Congress wrote into the NEPA requirements.

Moreover, a 7% discount rate is inconsistent with best economic practices, including under Circular A-4. In 2015, OMB explained that “Circular A-4 is a *living document*. . . . [T]he use of **7 percent is not considered appropriate** for intergenerational discounting. There is wide support for this view in the academic literature, and it is recognized in Circular A-4 itself.”¹³³ While Circular A-4 tells agencies generally to use a 7% discount rate in addition to lower rates for typical rules,¹³⁴ the guidance does not intend for default assumptions to produce analyses inconsistent with best economic practices. Circular A-4 clearly supports using lower rates to the exclusion of a 7% rate for the costs and benefits occurring over the extremely long, 300-year time horizon of climate effects.

Circular A-4 clearly requires agency analysts to do more than rigidly apply default assumptions: “You cannot conduct a good regulatory analysis according to a formula. Conducting high-quality analysis requires competent professional judgment.”¹³⁵ As such, analysis must be “based on the best reasonably obtainable scientific, technical, and economic information available,”¹³⁶ and agencies must “[u]se **sound and defensible values** or procedures to monetize benefits and costs, and ensure that key analytical assumptions are defensible.”¹³⁷ Rather than assume a 7% discount rate should be applied automatically to every analysis, Circular A-4 requires agencies to justify the choice of discount rates for each analysis: “[S]tate in your report what assumptions were used, *such as . . . the discount rates* applied to future benefits and costs,” and explain “clearly how you arrived at your estimates.”¹³⁸ Based on Circular A-4’s criteria, there are numerous reasons why applying a 7% discount rate to climate effects that occur over a 300-year time horizon would be unjustifiable.

First, basing the discount rate on the **consumption rate of interest** is the correct framework for analysis of climate effects; a discount rate based on the private return to capital is inappropriate. Circular A-4 does suggest that 7% should be a “default position” that reflects regulations that primarily displace capital investments; however, the Circular explains that “[w]hen regulation primarily and directly affects private consumption . . . a *lower discount rate is appropriate*.”¹³⁹ The 7% discount rate is based on a private sector rate of return on capital, but private market participants typically have short time horizons. By contrast, climate change concerns the public well-being broadly. Rather than evaluating an optimal outcome from the narrow perspective of investors alone, economic theory requires analysts to make the optimal choices based on societal preferences and social discount rates. Moreover, because

CO8-1

¹³² See 115 Cong. Rec. 40419 (1969) (emphasis added); see also same in Senate Report 91-296 (1969).

¹³³ Interagency Working Group on the Social Cost of Carbon, *Response to Comments: Social Cost of Carbon for Regulatory Impact Analysis under Executive Order 12,866* at 36 (July 2015) [hereinafter, OMB 2015 Response to Comments].

¹³⁴ Circular A-4 at 36 (“For regulatory analysis, you should provide estimates of net benefits using both 3 percent and 7 percent....If your rule will have important intergenerational benefits or costs you might consider a further sensitivity analysis using a lower but positive discount rate in addition to calculating net benefits using discount rates of 3 and 7 percent.”).

¹³⁵ *Id.* at 3.

¹³⁶ *Id.* at 17.

¹³⁷ *Id.* at 27 (emphasis added).

¹³⁸ *Id.* at 3 (emphasis added).

¹³⁹ *Id.* at 33 (emphasis added).

climate change is expected to largely affect large-scale consumption, as opposed to capital investment,¹⁴⁰ a 7% rate is inappropriate.

In 2013, OMB called for public comments on the social cost of greenhouse gases. In its 2015 Response to Comment document,¹⁴¹ OMB (together with the other agencies from the IWG) explained that

the consumption rate of interest is the correct concept to use . . . as the impacts of climate change are measured in consumption-equivalent units in the three IAMs used to estimate the SCC. This is consistent with OMB guidance in Circular A-4, which states that when a regulation is expected to primarily affect private consumption—for instance, via higher prices for goods and services—it is appropriate to use the consumption rate of interest to reflect how private individuals trade-off current and future consumption.¹⁴²

The Council of Economic Advisers similarly interprets Circular A-4 as requiring agencies to choose the appropriate discount rate based on the nature of the regulation: “[I]n Circular A-4 by the Office of Management and Budget (OMB) the appropriate discount rate to use in evaluating the net costs or benefits of a regulation depends on whether the regulation primarily and directly affects private consumption or private capital.”¹⁴³ The NAS also explained that a consumption rate of interest is the appropriate basis for a discount rate for climate effects.¹⁴⁴ For this reason, 7% is an inappropriate choice of discount rate for the impacts of climate change.

Second, **uncertainty over the long time horizon** of climate effects should drive analysts to select a lower discount rate. As an example of when a 7% discount rate is appropriate, Circular A-4 identifies an EPA rule with a 30-year timeframe of costs and benefits.¹⁴⁵ By contrast, greenhouse gas emissions generate effects stretching out across 300 years. As Circular A-4 notes, while “[p]rivate market rates provide a reliable reference for determining how society values time within a generation, but for extremely long time periods no comparable private rates exist.”¹⁴⁶

¹⁴⁰ “There are two rationales for discounting future benefits—one based on consumption and the other on investment. The consumption rate of discount reflects the rate at which society is willing to trade consumption in the future for consumption today. Basically, we discount the consumption of future generations because we assume future generations will be wealthier than we are and that the utility people receive from consumption declines as their level of consumption increases. . . . The investment approach says that, as long as the rate of return to investment is positive, we need to invest less than a dollar today to obtain a dollar of benefits in the future. Under the investment approach, the discount rate is the rate of return on investment. If there were no distortions or inefficiencies in markets, the consumption rate of discount would equal the rate of return on investment. There are, however, many reasons why the two may differ. As a result, using a consumption rather than investment approach will often lead to very different discount rates.” Maureen Cropper, *How Should Benefits and Costs Be Discounted in an Intergenerational Context?*, 183 *RESOURCES* 30, 33.

¹⁴¹ Note that this document was not withdrawn by Executive Order 13,783.

¹⁴² OMB 2015 Response to Comments, *supra* note 133, at 22.

¹⁴³ Council of Econ. Advisers, *Discounting for Public Policy: Theory and Recent Evidence on the Merits of Updating the Discount Rate* at 1 (CEA Issue Brief, 2017), available at https://obamawhitehouse.archives.gov/sites/default/files/page/files/201701_cea_discounting_issue_brief.pdf. In theory, the two rates would be the same, but “given distortions in the economy from taxation, imperfect capital markets, externalities, and other sources, the SRTP and the marginal product of capital need not coincide, and analysts face a choice between the appropriate opportunity cost of a project and the appropriate discount rate for its benefits.” *Id.* at 9. The correct discount rate for climate change is the social return to capital (i.e., returns minus the costs of externalities), not the private return to capital (which measures solely the returns).

¹⁴⁴ NAS Second Report, *supra*, at 28; see also Kenneth Arrow et al., *Is There a Role for Benefit-Cost Analysis in Environmental, Health, and Safety Regulation?*, 272 *Science* 221 (1996) (explaining that a consumption-based discount rate is appropriate for climate change).

¹⁴⁵ Circular A-4 at 34. See also OMB 2015 Response to Comments, *supra* note 133, at 21 (“While most regulatory impact analysis is conducted over a time frame in the range of 20 to 50 years”).

¹⁴⁶ Circular A-4 at 36.

CO8-1

CO8-1

Circular A-4 discusses how uncertainty over long time horizons drives the discount rate lower: “the longer the horizon for the analysis,” the greater the “uncertainty about the appropriate value of the discount rate,” which supports a lower rate.¹⁴⁷ Circular A-4 cites the work of renowned economist Martin Weitzman and concludes that the “certainty-equivalent discount factor corresponds to *the minimum discount rate having any substantial positive probability*.”¹⁴⁸ The NAS makes the same point about discount rates and uncertainty.¹⁴⁹

Third, a 7% percent discount rate would be inappropriate for climate change because it is based on outdated data and diverges from the current economic consensus. Circular A-4 requires that assumptions—including discount rate choices—are “based on the best reasonably obtainable scientific, technical, and economic information available.”¹⁵⁰ Yet Circular A-4’s own default assumption of a 7% discount rate was published 14 years ago and was based on data from decades ago.¹⁵¹ Circular A-4’s guidance on discount rates is in need of an update, as the Council of Economic Advisers detailed earlier this year after reviewing the best available economic data and theory:

The discount rate guidance for Federal policies and projects was last revised in 2003. Since then a general reduction in interest rates along with a reduction in the forecast of long-run interest rates, warrants serious consideration for a reduction in the discount rates used for benefit-cost analysis.¹⁵²

In addition to recommending a value below 7% as the discount factor based on private capital returns, the Council of Economic Advisers further explains that, because long-term interest rates have fallen, a discount rate based on the consumption rate of interest “should be at most 2 percent,”¹⁵³ which further confirms that applying a 7% rate to a context like climate change would be wildly out of step with the latest data and theory. Similarly, recent expert elicitations—a technique supported by Circular A-4 for filling in gaps in knowledge¹⁵⁴—indicate that a growing consensus among experts in climate economics for a discount rate between 2% and 3%; 5% represents the upper range of values recommended by experts, and few to no experts support discount rates greater than 5% being applied to the costs and benefits of climate change.¹⁵⁵ Tellingly, none of the integrated assessment models (DICE, FUND, and

¹⁴⁷ *Id.*

¹⁴⁸ *Id.* (emphasis added); see also CEA, *supra* note 143, at 9: “Weitzman (1998, 2001) showed theoretically and Newell and Pizer (2003) and Groom et al. (2007) confirm empirically that discount rate uncertainty can have a large effect on net present values. A main result from these studies is that if there is a persistent element to the uncertainty in the discount rate (e.g., the rate follows a random walk), then it will result in an effective (or certainty-equivalent) discount rate that declines over time. Consequently, lower discount rates tend to dominate over the very long term, regardless of whether the estimated investment effects are predominantly measured in private capital or consumption terms (see Weitzman 1998, 2001; Newell and Pizer 2003; Groom et al. 2005, 2007; Gollier 2008; Summers and Zeckhauser 2008; and Gollier and Weitzman 2010).”

¹⁴⁹ NAS Second Report, *supra* note 61, at 27.

¹⁵⁰ CEQ regulations implementing NEPA similarly require that information in NEPA documents be “of high quality” and states that “[a]ccurate scientific analysis . . . [is] essential to implementing NEPA.” 40 C.F.R. § 1500.1(b).

¹⁵¹ The 7% rate was based on a 1992 report; the 3% rate was based on data from the thirty years preceding the publication of Circular A-4 in 2003. Circular A-4 at 33.

¹⁵² CEA, *supra* note 143, at 1; *id.* at 3 (“In general the evidence supports lowering these discount rates, with a plausible best guess based on the available information being that the lower discount rate should be at most 2 percent while the upper discount rate should also likely be reduced.”); *id.* at 6 (“The Congressional Budget Office, the Blue Chip consensus forecasts, and the Administration forecasts all place the ten year treasury yield at less than 4 percent in the future, while at the same time forecasting CPI inflation of 2.3 or 2.4 percent per year. The implied real ten year Treasury yield is thus below 2 percent in all these forecasts.”).

¹⁵³ *Id.* at 1.

¹⁵⁴ Circular A-4 at 41.

¹⁵⁵ Peter Howard & Derek Sylvan, *The Economic Climate: Establishing Expert Consensus on the Economics of Climate Change* (Inst. Policy Integrity Working Paper 2015/1); M.A. Drupp, et al., *Discounting Disentangled: An Expert Survey on the*

PAGE) used to build the IWG's estimates of the social cost of greenhouse gases uses a 7% discount rate. Based on current economic data and theory, the most appropriate discount rate for climate change is 3% or lower.

Fourth, Circular A-4 requires more of analysts than giving all possible assumptions and scenarios equal attention in a sensitivity analysis; if alternate assumptions would fundamentally change the decision, Circular A-4 requires analysts to select the **most appropriate assumptions from the sensitivity analysis**.

Circular A-4 indicates that significant intergenerational effects will warrant a special sensitivity analysis focused on discount rates even lower than 3%:

Special ethical considerations arise when comparing benefits and costs across generations. . . It may not be appropriate for society to demonstrate a similar preference when deciding between the well-being of current and future generations. . . If your rule will have important intergenerational benefits or costs you might consider a further sensitivity analysis using a lower but positive discount rate in addition to calculating net benefits using discount rates of 3 and 7 percent.¹⁵⁶

Elsewhere in Circular A-4, OMB clarifies that sensitivity analysis should not result in a rigid application of all available assumptions regardless of plausibility. Circular A-4 instructs agencies to depart from default assumptions when special issues "call for different emphases" depending on "the sensitivity of the benefit and cost estimates to the key assumptions."¹⁵⁷ More specifically:

If benefit or cost estimates depend heavily on certain assumptions, you should make those assumptions explicit and carry out *sensitivity analyses using plausible alternative assumptions*. If the value of net benefits changes from positive to negative (or vice versa) or if the relative ranking of regulatory options changes with alternative plausible assumptions, you should conduct further analysis to determine **which of the alternative assumptions is more appropriate**.¹⁵⁸

In other words, if using a 7% discount rate would fundamentally change the agency's decision compared to using a 3% or lower discount rate, the agency must evaluate which assumption is most appropriate. Since OMB, the Council of Economic Advisers, the National Academies of Sciences, and the economic literature all conclude that a 7% rate is inappropriate for climate change, agencies should select a 3% or lower rate. Applying a 7% rate to climate effects cannot be justified "based on the best reasonably obtainable scientific, technical, and economic information available" and is inconsistent with the proper treatment of uncertainty over long time horizons.

Finally, to the extent there is uncertainty around the discount rate over long periods of time, the growing economic consensus supports shifting to a declining discount rate framework. Circular A-4 contemplates the use of declining discount rates in its reference to the work of Weitzman.¹⁵⁹ As the Council of Economic Advisers explained earlier this year, Weitzman and others developed the foundation for a declining discount rate approach, wherein rates start relatively higher for near-term

Determinants of the Long-Term Social Discount Rate (London School of Economics and Political Science Working Paper, May 2015) (finding consensus on social discount rates between 1-3%).

¹⁵⁶ Circular A-4 at 35-36.

¹⁵⁷ *Id.* at 3.

¹⁵⁸ *Id.* at 42 (emphasis added).

¹⁵⁹ Circular A-4, at page 36, cites to Weitzman's chapter in Portney & Weyant, eds. (1999); that chapter, at page 29, recommends a declining discount rate approach: "a sliding-scale social discounting strategy" with the rate at 3-4% through year 25; then around 2% until year 75; then around 1% until year 300; and then 0% after year 300.

CO8-1

CO8-1

costs and benefits but steadily decline over time according to a predetermined schedule until, in the very long-term, very low rates dominate due to uncertainty.¹⁶⁰ The National Academies of Sciences' report also strongly endorses a declining discount rate approach due to uncertainty.¹⁶¹ In other words, the rational response to a concern about uncertainty over the discount rate is not to abandon the social cost of greenhouse gas methodology, but to apply declining discount rates and to treat the estimates calculated at a constant 3% rate as conservative lower-bound estimates.

One possible schedule of declining discount rates was proposed by Weitzman.¹⁶² It is derived from a broad survey of top economists and other climate experts and explicitly incorporates arguments around interest rate uncertainty. Work by Arrow *et al*, Cropper *et al*, and Gollier and Weitzman, among others, similarly argue for a declining interest rate schedule and lay out the fundamental logic.¹⁶³ Another schedule of declining discount rates has been adopted by the United Kingdom.¹⁶⁴

The technical appendix on discounting attached to these comments more thoroughly reviews the various schedules of declining discount rates available for agencies to select and explains why agencies not only can but should adopt a declining discount framework to address uncertainty. An additional technical appendix on uncertainty explains in detail why uncertainty around the social cost of greenhouse gas points toward higher values. Shifting to a declining discount rate framework would increase the social cost of greenhouse gases.¹⁶⁵ Consequently, a central estimate calculated at 3% should be considered a lower-bound of the social cost of greenhouse gases. But even providing a lower-bound estimate of the social cost of greenhouse gases helps inform decisionmakers and the public, and FERC is required by NEPA to provide some monetization of climate damages, consistent with economic best practices.

Similarly, a 300-year time horizon is required by best economic practices. In 2017, the National Academies of Sciences issued a report stressing the importance of a longer time horizon for calculating

¹⁶⁰ CEA, *supra* note 143, at 9 (“[A]nother way to incorporate uncertainty when discounting the benefits and costs of policies and projects that accrue in the far future—applying discount rates that decline over time. This approach uses a higher discount rate initially, but then applies a graduated schedule of lower discount rates further out in time. The first argument is based on the application of the Ramsey framework in a stochastic setting (Gollier 2013), and the second is based on Weitzman’s ‘expected net present value’ approach (Weitzman 1998, Gollier and Weitzman 2010). In light of these arguments, the governments of the United Kingdom and France apply declining discount rates to their official public project evaluations.”).

¹⁶¹ NAS Second Report, *supra*.

¹⁶² Martin L. Weitzman, *Gamma Discounting*, 91 AM. ECON. REV. 260, 270 (2001). Weitzman’s schedule is as follows:

1-5 years	6-25 years	26-75 years	76-300 years	300+ years
4%	3%	2%	1%	0%

¹⁶³ Kenneth J. Arrow *et al.*, *Determining Benefits and Costs for Future Generations*, 341 SCIENCE 349 (2013); Kenneth J. Arrow *et al.*, *Should Governments Use a Declining Discount Rate in Project Analysis?*, REV ENVIRON ECON POLICY 8 (2014); Maureen L. Cropper *et al.*, *Declining Discount Rates*, AMERICAN ECONOMIC REVIEW: PAPERS AND PROCEEDINGS (2014); Christian Gollier & Martin L. Weitzman, *How Should the Distant Future Be Discounted When Discount Rates Are Uncertain?* 107 ECONOMICS LETTERS 3 (2010).

¹⁶⁴ Joseph Lowe, H.M. Treasury, U.K., *Intergenerational Wealth Transfers and Social Discounting: Supplementary Green Book Guidance 5 (2008)*, available at [http://www.hm-treasury.gov.uk/d/4\(5\).pdf](http://www.hm-treasury.gov.uk/d/4(5).pdf). The U.K. declining discount rate schedule that subtracts out a time preference value is as follows:

0-30 years	31-75 years	76-125 years	126-200 years	201-300 years	301+ years
3.00%	2.57%	2.14%	1.71%	1.29%	0.86%

¹⁶⁵ This assumes the use of reasonable values in the Ramsey equation. But in general, as compared to a constant discount rate, a declining rate approach should decrease the effective discount rate.

the social cost of greenhouse gases. The report states that, “[i]n the context of the socioeconomic, damage, and discounting assumptions, the time horizon needs to be long enough to capture the vast majority of the present value of damages.”¹⁶⁶ The report goes on to note that the length of the time horizon is dependent “on the rate at which undiscounted damages grow over time and on the rate at which they are discounted. Longer time horizons allow for representation and evaluation of longer-run geophysical system dynamics, such as sea level change and the carbon cycle.”¹⁶⁷ In other words, after selecting the appropriate discount rate based on theory and data (in this case, 3% or below), analysts should determine the time horizon necessary to capture all costs and benefits that will have important net present values at the discount rate. Therefore, a 3% or lower discount rate for climate change implies the need for a 300-year horizon to capture all significant values. NAS reviewed the best available, peer-reviewed scientific literature and concluded that the effects of greenhouse gas emissions over a 300-year period are sufficiently well established and reliable as to merit consideration in estimates of the social cost of greenhouse gases.¹⁶⁸

Agencies Should Follow the Social Cost of Greenhouse Gas Protocol’s Treatment of Uncertainty

The approach developed and utilized by the IWG remains the best methodology, based on the best currently available scientific and economic data. In particular, the IWG modeled the uncertainty over the value of the equilibrium climate sensitivity parameter using the Roe and Baker distribution calibrated to the IPCC reports. Using well-established analytic tools to capture and reflect uncertainty, including a Monte Carlo simulation to randomly select the equilibrium climate sensitivity parameter and other uncertainty parameters selected by the model developers, the IWG quantitatively modeled the uncertainty underlying how greenhouse gas emissions affect temperature. Rather than guess about “a range of potential global temperature changes that may result,” NHTSA must undertake a quantitative assessment of uncertainty and can rely on the same models and methodologies as the IWG to connect each ton of greenhouse gases avoided or emitted as a result of the CAFE standards with the associated global climate effects.¹⁶⁹

To further deal with uncertainty, the IWG recommended to agencies a range of four estimates: three central or mean-average estimates at a 2.5%, 3%, and 5% discount rate respectively, and a 95th percentile value at the 3% discount rate. While the IWG’s technical support documents disclosed fuller probabilities distributions, these four estimates were chosen by agencies to be the focus for decisionmaking. In particular, application of the 95th percentile value was not part of an effort to show the probability distribution around the 3% discount rate; rather, the 95th percentile value serves as a methodological shortcut to approximate the uncertainties around low-probability but high-damage, catastrophic, or irreversible outcomes that are currently omitted or undercounted in the economic models.

The shape of the distribution of climate risks and damages includes a long tail of lower-probability, high-damage, irreversible outcomes due to “tipping points” in planetary systems, inter-sectoral interactions, and other deep uncertainties. Climate damages are not normally distributed around a central estimate, but rather feature a significant right skew toward catastrophic outcomes. In fact, a 2015 survey of economic experts concludes that catastrophic outcomes are increasingly likely to occur.¹⁷⁰ Because the

CO8-1

¹⁶⁶ NAS Second Report, *supra* note 61, at 78.

¹⁶⁷ *Id.*

¹⁶⁸ NAS First Report, *supra* note 62, at 32.

¹⁶⁹ NHTSA may have used other methodologies for quantitative assessment of uncertainty in the past.

¹⁷⁰ Policy Integrity, *Expert Consensus on the Economics of Climate Change 2* (2015), available at <http://policyintegrity.org/files/publications/ExpertConsensusReport.pdf> [hereinafter *Expert Consensus*] (“Experts believe that

three integrated assessment models that the IWG's methodology relied on are unable to systematically account for these potential catastrophic outcomes, a 95th percentile value was selected instead to account for such uncertainty. There are no similarly systematic biases pointing in the other direction which might warrant giving weight to a low-percentile estimate. Consequently, in any treatment of uncertainty, NHTSA should give sufficient attention to the long tail on the probability distribution that extends into high temperature ranges and catastrophic damages.

Additionally, the 95th percentile value addresses the strong possibility of widespread risk aversion with respect to climate change. The integrated assessment models do not reflect that individuals likely have a higher willingness to pay to reduce low-probability, high-impact damages than they do to reduce the likelihood of higher-probability but lower impact damages with the same expected cost. Beyond individual members of society, governments also have reasons to exercise some degree of risk aversion to irreversible outcomes like climate change.

In short, the 95th percentile estimate attempts to capture risk aversion and uncertainties around lower-probability, high-damage, irreversible outcomes that are currently omitted or undercounted by the models. There is no need to balance out this estimate with a low-percentile value, because the reverse assumptions are not reasonable:

- There is no reason to believe the public or the government will be systematically risk seeking with respect to climate change.¹⁷¹
- The consequences of overestimating the risk of climate damages (i.e., spending more than we need to on mitigation and adaptation) are not nearly as irreversible as the consequences of underestimating the risk of climate damage (i.e., failing to prevent catastrophic outcomes).
- Though some uncertainties might point in the direction of lower social cost of greenhouse gas values, such as those related to the development of breakthrough adaptation technologies, the models already account for such uncertainties around adaptation; on balance, most uncertainties strongly point toward higher, not lower, social cost of greenhouse gas estimates.¹⁷²
- There is no empirical basis for any "long tail" of potential benefits that would counteract the potential for extreme harm associated with climate change.

Moreover, even the best existing estimates of the social cost of greenhouse gases are likely underestimated because the models currently omit many significant categories of damages—such as depressed economic growth, pests, pathogens, erosion, air pollution, fire, dwindling energy supply,

there is greater than a 20% likelihood that this same climate scenario would lead to a 'catastrophic' economic impact (defined as a global GDP loss of 25% or more)."). See also Robert Pindyck, *The Social Cost of Carbon Revisited* (National Bureau of Economic Research, No. w22807, 2016).

¹⁷¹ As a 2009 survey revealed, the vast majority of economic experts support the idea that "uncertainty associated with the environmental and economic effects of greenhouse gas emissions increases the value of emission controls, assuming some level of risk-aversion." See *Expert Consensus*, *supra* note 170, at 3 (citing 2009 survey).

¹⁷² See Richard L. Revesz et al., *Global Warming: Improve Economic Models of Climate Change*, 508 *NATURE* 173 (2014). R. Tol, *The Social Cost of Carbon*, 3 *Annual Rev. Res. Econ.* 419 (2011) ("[U]ndesirable surprises seem more likely than desirable surprises. Although it is relatively easy to imagine a disaster scenario for climate change—for example, involving massive sea level rise or monsoon failure that could even lead to mass migration and violent conflict—it is not at all easy to imagine that climate change will be a huge boost to human welfare.").

CO8-1

health costs, political conflict, and ocean acidification—and because of other methodological choices.¹⁷³ There is little to no support among economic experts to give weight to any estimate lower than the 5% discount rate estimate.¹⁷⁴ Rather, even a discount rate at 3% or below likely continues to underestimate the true social cost of greenhouse gases.

The National Academies of Sciences did recommend that the IWG document its full treatment of uncertainty in an appendix and disclose low-probability as well as high-probability estimates of the social cost of greenhouse gases.¹⁷⁵ However, that does not mean it would be appropriate for individual agencies to rely on low-percentile estimates to justify decisions. While disclosing low-percentile estimates as a sensitivity analysis may promote transparency, relying on such an estimate for decisionmaking—in the face of contrary guidance from the best available science and economics on uncertainty and risk—would not be a “credible, objective, realistic, and scientifically balanced” approach to uncertainty.

More generally, agencies in general—and FERC in this particular instance—should remember that uncertainty is *not* a reason to abandon the social cost of greenhouse gas methodologies; quite the contrary uncertainty supports higher estimates of the social cost of greenhouse gases, because most uncertainties regarding climate change entail tipping points, catastrophic risks, and unknown unknowns about the damages of climate change. Because the key uncertainties of climate change include the risk of irreversible catastrophes, applying an options value framework to the regulatory context strengthens the case for ambitious regulatory action to reduce greenhouse gas emissions. There are numerous well-established, rigorous analytical tools available to help agencies characterize and quantitatively assess uncertainty, such as Monte Carlo simulations, and the IWG’s social cost of greenhouse gas protocol incorporates those tools. For more details, please see the attached technical appendix on uncertainty.

Sincerely,

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* No part of this document purports to present New York University School of Law’s views, if any.

Attached: Joint Comments to FERC on Using the Social Cost of Greenhouse Gases to Weigh Climate Impacts of New Natural Gas Transportation Facilities in Environmental Analyses and in Reviews of Public Convenience and Necessity (Docket No. PL18-1-000) (submitted July 25, 2018)

¹⁷³ See Revesz et al., *Global Warming: Improve Economic Models of Climate Change*, *supra* note 172; Peter Howard, *Omitted Damages: What’s Missing from the Social Cost of Carbon* (Cost of Carbon Project Report, 2014); Frances C. Moore & Delavane B. Diaz, *Temperature Impacts on Economic Growth Warrant Stringent Mitigation Policy*, 5 *NATURE CLIMATE CHANGE* 127 (2015) (demonstrating SCC may be biased downward by more than a factor of six by failing to include the climate’s effect on economic growth).

¹⁷⁴ The existing estimates based on the 5% discount rate already provides a lower-bound; indeed, if anything the 5% discount rate is already far too conservative as a lower-bound. A recent survey of 365 experts on the economics of climate change found that 90% of experts believe a 3% discount rate or lower is appropriate for climate change; a 5% discount rate falls on the extremely high end of what experts would recommend. *Expert Consensus*, *supra* note 170, at 21; *see also* Drupp, M.A., et al. *Discounting Disentangled: An Expert Survey on the Determinants of the Long-Term Social Discount Rate* (London School of Economics and Political Science Working Paper, May 2015) (finding consensus on social discount rates between 1-3%). Only 8% of the experts surveyed believe that the central estimate of the social cost of carbon is below \$40, and 69% of experts believed the value should be at or above the central estimate of \$40. *Expert Consensus*, *supra* note 170, at 18.

¹⁷⁵ Nat’l Acad. Of Sci., *Assessment of Approaches to Updating the Social Cost of Carbon* 49 (2016) (“[T]he IWG could identify a high percentile (e.g., 90th, 95th) and corresponding low percentile (e.g., 10th, 5th) of the SCC frequency distributions on each graph.”).

CO8-1

Technical Appendix: Uncertainty

Contrary to the arguments made by many opposed to strong federal climate action, uncertainty about the full effects of climate change *raises* the social cost of greenhouse gases and warrants *more* stringent climate policy.¹⁷⁶ Integrated assessment models (IAMs) currently used to calculate the SCC show that the net effect of uncertainty about economic damage resulting from climate change, costs of mitigation, future economic development, and many other parameters raises the SCC compared to the case where models simply use our current best guesses of these parameters.¹⁷⁷ Even so, IAMs still underestimate the impact of uncertainty on the SCC by not accounting for a host of fundamental features of the climate problem: the irreversibility of climate change, society's aversion to risk and other social preferences, option value, and many catastrophic impacts.¹⁷⁸ Rather than being a reason not to take action, uncertainty increases the SCC and should lead to more stringent policy to address climate change.¹⁷⁹

Types of Uncertainty in the IAMs

IAMs incorporate two types of uncertainty: parametric uncertainty and stochastic uncertainty. Parametric uncertainty covers uncertainty in model design and inputs, including the selected parameters, correct functional forms, appropriate probability distribution functions, and model structure. With learning, these uncertainties should decline over time as more information becomes available.¹⁸⁰ Stochastic uncertainty is persistent randomness in the economic-climate system, including various environmental phenomena such as volcanic eruptions and sun spots.¹⁸¹ Uncertainties are present in each component of the IAMs: socio-economic scenarios, the simple climate model, the damage and abatement cost functions, and the social welfare function (including the discount rate).¹⁸²

¹⁷⁶ Peterson (2006) states "Most modeling results show (as can be expected) that there is optimally more emission abatement if uncertainties in parameters or the possibility of catastrophic events are considered." Peterson, S. (2006). Uncertainty and economic analysis of climate change: A survey of approaches and findings. *Environmental Modeling & Assessment*, 11(1), 1-17.

¹⁷⁷ Tol, R. S. (1999). Safe policies in an uncertain climate: an application of FUND. *Global Environmental Change*, 9(3), 221-232; Peterson, S. (2006). Uncertainty and economic analysis of climate change: A survey of approaches and findings. *Environmental Modeling & Assessment*, 11(1), 1-17; IWG, 2016 TSD, *supra*.

¹⁷⁸ Pindyck, R. S. (2007). Uncertainty in environmental economics. *Review of environmental economics and policy*, 1(1), 45-65; Golub, A., Narita, D., & Schmidt, M. G. (2014). Uncertainty in integrated assessment models of climate change: Alternative analytical approaches. *Environmental Modeling & Assessment*, 19(2), 99-109; Lemoine, D., & Rudik, I. (2017). Managing Climate Change Under Uncertainty: Recursive Integrated Assessment at an Inflection Point. *Annual Review of Resource Economics* 9:18.1-18.26.

¹⁷⁹ See *supra* note 178.

¹⁸⁰ Learning comes in multiple forms: passive learning of anticipated information that arrives exogenous to the emission policy (such as academic research), active learning of information that directly stems from the choice of the GHG emission level (via the policy process), and learning of unanticipated information (Kann and Weyant, 2000; Lemoine and Rudik, 2017).

¹⁸¹ Kann, A., & Weyant, J. P. (2000). Approaches for performing uncertainty analysis in large-scale energy/economic policy models. *Environmental Modeling & Assessment*, 5(1), 29-46; Peterson (2006), *supra* note 176; Golub et al. *supra* note 178.

A potential third type of uncertainty arises due to ethical or value judgements: normative uncertainty. Peterson (2006) *supra* note 176; Heal, G., & Millner, A. (2014). Reflections: Uncertainty and decision making in climate change economics. *Review of Environmental Economics and Policy*, 8(1), 120-137. For example, there is some normative debate over the appropriate consumption discount rate to apply in climate economics, though widespread consensus exists that using the social opportunity cost of capital is inappropriate (see earlier discussion). Preference uncertainty should be modeled as a declining discount rate over time (see earlier discussion), not using uncertain parameters. Kann & Weyant, *supra* note 181.

¹⁸² Peterson (2006), *supra* note 176; Pindyck (2007), *supra* note 178; Heal & Millner, *supra* note 181.

CO8-1

When modeling climate change uncertainty, scientists and economists have long emphasized the importance of accounting for the potential of catastrophic climate change.¹⁸³ Catastrophic outcomes combine several overlapping concepts including unlucky states of the world (i.e., bad draws), deep uncertainty, and climate tipping points and elements.¹⁸⁴ Traditionally, IAM developers address uncertainty by specifying probability distributions over various climate and economic parameters. This type of uncertainty implies the possibility of an especially bad draw if multiple uncertain parameters turn out to be lower than we expect, causing actual climate damages to greatly exceed expected damages.

Our understanding of the climate and economic systems is also affected by so-called “deep uncertainty,” which can be thought of as uncertainty over the true probability distributions for specific climate and economic parameters.¹⁸⁵ The mean and variance of many uncertain climate phenomena are unknown due to lack of data, resulting in “fat-tailed distributions”—i.e., the tail of the distributions decline to zero slower than the normal distribution. Fat-tailed distributions result when the best guess of the distribution is derived under learning.¹⁸⁶ Given the general opinion that bad surprises are likely to outweigh good surprises in the case of climate change,¹⁸⁷ modelers capture deep uncertainty by selecting probability distributions with a fat upper tail which reflects the greater likelihood of extreme events.¹⁸⁸ The possibility of fat tails increases the likelihood of a “very” bad draw with high economic costs, and can result in a very high (and potentially infinite) expected cost of climate change (a phenomenon known as the dismal theory).¹⁸⁹

Climate tipping elements are environmental thresholds where a small change in climate forcing can lead to large, non-linear shifts in the future state of the climate (over short and long periods of time) through positive feedback (i.e., snowball) effects.¹⁹⁰ Tipping points refer to economically relevant thresholds after which change occurs rapidly (i.e., Gladwellian tipping points), such that opportunities for adaptation and intervention are limited.¹⁹¹ Tipping point examples include the reorganization of the Atlantic meridional overturning circulation (AMOC) and a shift to a more persistent El Niño regime in the

CO8-1

¹⁸³ Nordhaus, W. D. (2008). *A question of balance: Weighing the options on global warming policies*. Yale University Press; Kopp, R. E., Shwom, R. L., Wagner, G., & Yuan, J. (2016). Tipping elements and climate-economic shocks: Pathways toward integrated assessment. *Earth's Future*, 4(8), 346-372.

¹⁸⁴ Kopp et al. (2016), *supra* note 183.

¹⁸⁵ *Id.*

¹⁸⁶ Nordhaus, W. D. (2009). *An Analysis of the Dismal Theorem* (No. 1686). Cowles Foundation Discussion Paper; Weitzman, M. L. (2011). Fat-tailed uncertainty in the economics of catastrophic climate change. *Review of Environmental Economics and Policy*, 5(2), 275-292; Pindyck, R. S. (2011). Fat tails, thin tails, and climate change policy. *Review of Environmental Economics and Policy*, 5(2), 258-274.

¹⁸⁷ Mastrandrea, M. D. (2009). *Calculating the benefits of climate policy: examining the assumptions of integrated assessment models*. Pew Center on Global Climate Change Working Paper; Tol, R. S. (2012). On the uncertainty about the total economic impact of climate change. *Environmental and Resource Economics*, 53(1), 97-116.

¹⁸⁸ Weitzman (2011), *supra* note 186, makes clear that “deep structural uncertainty about the unknown unknowns of what might go very wrong is coupled with essentially unlimited downside liability on possible planetary damages. This is a recipe for producing what are called ‘fat tails’ in the extreme of critical probability distributions.”

¹⁸⁹ Weitzman, M. L. (2009). On modeling and interpreting the economics of catastrophic climate change. *The Review of Economics and Statistics*, 91(1), 1-19; Nordhaus (2009), *supra* note 186; Weitzman (2011), *supra* note 186.

¹⁹⁰ Tipping elements are characterized by: (1) deep uncertainty, (2) absence from climate models, (3) larger resulting changes relative to the initial change crossing the relevant threshold, and (4) irreversibility. Kopp et al. (2016), *supra* note 183.

¹⁹¹ *Id.*

Pacific Ocean.¹⁹² Social tipping points—including climate-induced migration and conflict—also exist. These various tipping points interact, such that triggering one tipping point may affect the probabilities of triggering other tipping points.¹⁹³ There is some overlap between tipping point events and fat tails in that the probability distributions for how likely, how quick, and how damaging tipping points will be are unknown.¹⁹⁴ Accounting fully for these most pressing, and potentially most dramatic, uncertainties in the climate-economic system matter because humans are risk averse and tipping points—like many other aspects of climate change—are, by definition, irreversible

How IAMs and the IWG Account for Uncertainty

Currently, IAMs (including all of those used by the IWG) capture uncertainty in two ways: deterministically and through uncertainty propagation. For the deterministic method, the modeler assumes away uncertainty (and thus the possibility of bad draws and fat tails) by setting parameters equal to their most likely (median) value. Using these values, the modeler calculates the median SCC value. Typically, the modeler conducts sensitivity analysis over key parameters—one at a time or jointly—to determine the robustness of the modeling results. This is the approach employed by Nordhaus in the preferred specification of the DICE model¹⁹⁵ used by the IWG.

Uncertainty propagation is most commonly carried out using Monte Carlo simulation. In these simulations, the modeler randomly draws parameter values from each of the model's probability distributions, calculates the SCC for the draw, and then repeats this exercise thousands of times to calculate a mean social cost of carbon.¹⁹⁶ Tol, Anthoff, and Hope employ this technique in FUND and PAGE—as did the IWG (2010, 2013, and 2016)—by specifying probability distributions for the climate and economic parameters in the models. These models are especially helpful for assessing the net effect of different parametric and stochastic uncertainties. For instance, both the costs of mitigation and the damage from climate change are uncertain. Higher costs would warrant less stringent climate policies, while higher damages lead to more stringent policy, so theoretically, the effect of these two factors on climate policy could be ambiguous. Uncertainty propagation in an IAM calibrated to empirically motivated distributions, however, shows that climate damage uncertainty outweighs the effect of cost uncertainty, leading to a stricter policy when uncertainty is taken into account than when it is ignored.¹⁹⁷

¹⁹² *Id.*; Kriegler, E., Hall, J. W., Held, H., Dawson, R., & Schellnhuber, H. J. (2009). Imprecise probability assessment of tipping points in the climate system. *Proceedings of the national Academy of Sciences*, 106(13), 5041-5046; Diaz, D., & Keller, K. (2016). A potential disintegration of the West Antarctic Ice Sheet: Implications for economic analyses of climate policy. *The American Economic Review*, 106(5), 607-611. See Table 1 of Kopp et al. (2016) *supra* note 183, for a full list of known tipping elements and points.

¹⁹³ Kriegler et al. (2009), *supra* note 192; Cai, Y., Lenton, T. M., & Lontzek, T. S. (2016). Risk of multiple interacting tipping points should encourage rapid CO₂ emission reduction; Kopp et al. (2016) *supra* note 183.

¹⁹⁴ Peter Howard, *Omitted Damages: What's Missing from the Social Cost of Carbon 5* (Cost of Carbon Project Report, 2014), <http://costofcarbon.org/>; Kopp et al. (2016) *supra* note 183.

¹⁹⁵ Nordhaus, W. & Sator, P. (2013). DICE 2013: Introduction & User's Manual. Retrieved from Yale University, Department of Economics website: <http://www.econ.yale.edu/~nordhaus/homepage/documents/Dicemanualfull>

¹⁹⁶ In alternative calculation method, the modeler “performs optimization of policies for a large number of possible parameter combinations individually and estimates their probability weighted sum.” Golub et al. *supra* note 178. In more recent DICE-2016, Nordhaus conducts a three parameter analysis using this method to determine a SCC confidence interval. Given that PAGE and FUND model hundred(s) of uncertainty parameters, this methodology appears limited in the number of uncertain variables that can be easily specified.

¹⁹⁷ Tol (1999), *supra* note 177, in characterizing the FUND model, states, “Uncertainties about climate change impacts are more serious than uncertainties about emission reduction costs, so that welfare-maximizing policies are stricter under uncertainty than under certainty.”

CO8-1

This can be seen in the resulting right-skewed distribution of the SCC (see Figure 1 in IWG (2016)) where the mean (Monte Carlo) SCC value clearly exceeds the median (deterministic) SCC value.

The IWG was rigorous in addressing uncertainty. First, it conducted Monte Carlo simulations over the above IAMs specifying different possible outcomes for climate sensitivity (represented by a right skewed, fat tailed distribution to capture the potential of higher than expected warming). It also used scenario analysis: five different emissions growth scenarios and three discount rates. Second, the IWG (2016) reported the various moments and percentiles—including the 95th percentile—of the resulting SCC estimates. Third, the IWG put in place an updating process, e.g., the 2013 and 2016 revisions, which updates the models as new information becomes available.¹⁹⁸ As such, the IWG used the various tools that economists have developed over time to address the uncertainty inherent in estimating the economic cost of pollution: reporting various measures of uncertainty, using Monte Carlo simulations, and updating estimates as evolving research advances our knowledge of climate change. Even so, the IWG underestimate the SCC by failing to capture key features of the climate problem.

Current IAMs Underestimate the SCC by Failing to Sufficiently Model Uncertainty

Given the current treatment of uncertainty by the IWG (2016) and the three IAMs that they employ, the IWG (2016) estimates represent an underestimate of the SCC. DICE clearly underestimates the true value of the SCC by effectively eliminating the possibility of bad draws and fat tails through a deterministic model that relies on the median SCC value. Even with their calculation of the mean SCC, the FUND and PAGE also underestimate the metric's true value by ignoring key features of the climate-economic problem. Properly addressing the limitations of these models' treatment of uncertainty would further increase the SCC.

First, current IAMs insufficiently model catastrophic impacts. DICE fails to model both the possibility of bad draws and fat tails by applying the deterministic approach. Alternatively, FUND and PAGE ignore deep uncertainty by relying predominately on the thin-tailed triangular and gamma distributions.¹⁹⁹ The IWG (2010) only partially addresses this oversight by replacing the ECS parameter in DICE, FUND, and PAGE with a fat-tailed, right-skewed distribution calibrated to the IPCC's assumptions (2007), even though many other economic and climate phenomenon in IAMs are likely characterized by fat tails, including climate damages from high temperature levels, positive climate feedback effects, and tipping points.²⁰⁰ Recent work in stochastic dynamic programming tends to better integrate fat tails – particularly with respect to tipping points (see below) – and address additional aversion to this type of

¹⁹⁸ IWG (2010).

¹⁹⁹ Howard (2014), *supra* note 194. While both FUND and PAGE employ thin tailed distributions, the resulting distribution of the SCC is not always thin-tailed. In PAGE09, the ECS parameter is endogenous, such that the distribution of the ECS has a long tail following the IPCC (2007). See Chen, Z., Marquis, M., Averyt, K. B., Tignor, M., & Miller, H. L. (2007). Contribution of working group I to the fourth assessment report of the intergovernmental panel on climate change. *Cambridge, UK and New York: Cambridge University Press, 996p.* Similarly, while Anthoff and Tol do not explicitly utilize fat-tail distributions, the distribution of net present welfare from a Monte Carlos simulation is fat tailed. Anthoff, D., & Tol, R. S. (2014). The Climate Framework for Uncertainty, Negotiation and Distribution (FUND): Technical description, Version 3.8. Available at www.fund-model.org. Explicitly modeling parameter distributions as fat tailed may further increase the SCC.

²⁰⁰ Weitzman (2011), *supra* note 186; Kopp et al. (2016) *supra* note 183.

CO8-1

uncertainty (also known as ambiguity aversion); doing so can further increase the SCC under uncertainty.²⁰¹

In contrast to their approach to fat tails, the IAMs used by the IWG (2010; 2013; 2016) sometimes address climate tipping points, though they do not apply state-of-the-art methods for doing so. In early versions of DICE (DICE-2010 and earlier), Nordhaus implicitly attributes larger portions of the SCC to tipping points by including certainty equivalent damages of catastrophic events - representing two-thirds to three-quarter of damages in DICE – calibrated to an earlier Nordhaus (1994) survey of experts.²⁰² In PAGE09, Hope also explicitly models climate tipping points as a singular, discrete event (of a 5% to 25% loss in GDP) that has a probability (which grows as temperature increases) of occurring in each time period.²⁰³ Though not in the preferred versions of the IAMs employed by the IWG, some research also integrates specific tipping points into these IAMs finding even higher SCC estimates.²⁰⁴ Despite the obvious methodological basis for addressing tipping points, the latest versions of DICE²⁰⁵ and FUND exclude tipping points in their preferred specifications. Research shows that if these models were to correctly account for the full range of climate impacts—including tipping points—the resulting SCC estimates would increase.²⁰⁶

The IWG approach also fails to include a risk premium—that is, the amount of money society would require in order to accept the uncertainty (i.e., variance) over the magnitude of warming and the resulting damages from climate change relative to mean damages (IWG, 2010; IWG, 2015)). The mean of a distribution, which is a measure of a distribution's central tendency, represents only one descriptor or

²⁰¹ Lemoine, D., & Traeger, C. P. (2016a). Ambiguous tipping points. *Journal of Economic Behavior & Organization*, 132, 5-18; Lemoine & Rudik (2017), *supra* note 178. IAM modelers currently assume that society is equally averse to known unknown and known unknowns. Lemoine & Traeger, *id.*

²⁰² Nordhaus, W. D., & Boyer, J. (2000). *Warning the World: Economic Models of Global Warming*. MIT Press (MA); Nordhaus, W. D. (2008). *A question of balance: Weighing the options on global warming policies*. Yale University Press; Howard (2014), *supra* note 194; Kopp et al. (2016) *supra* note 183.

²⁰³ Hope (2006) also calibrated a discontinuous damage function in PAGE-99 used by IWG (2010). Howard (2014), *supra* note 194.

²⁰⁴ Kopp et al. (2016) *supra* note 183.

²⁰⁵ For DICE-2013 and DICE-2016, Nordhaus calibrates the DICE damage function using a meta-analysis based on estimates that mostly exclude tipping point damages. Howard, P. H., & Sterner, T. (2016). Few and Not So Far Between: A Meta-analysis of Climate Damage Estimates. *Environmental and Resource Economics*, 1-29.

²⁰⁶ Using FUND, Link and Tol (2010) find that a collapse of the AMOC would decrease GDP (and thus increase the SCC) by a small amount. Earlier modeling of this collapse in DICE find a more significance increase. Keller, K., Tan, K., Morel, F. M., & Bradford, D. F. (2000). Preserving the ocean circulation: implications for climate policy. *Climatic Change*, 47, 17-43; Mastrandrea, M. D., & Schneider, S. H. (2001). Integrated assessment of abrupt climatic changes. *Climate Policy*, 1(4), 433-449; Keller, K., Bolker, B. M., & Bradford, D. F. (2004). Uncertain climate thresholds and optimal economic growth. *Journal of Environmental Economics and management*, 48(1), 723-741. With respect to thawing of the permafrost, Hope and Schaefer (2016), Economic impacts of carbon dioxide and methane released from thawing permafrost. *Nature Climate Change*, 6(1), 56-59, and Gonzalez-Eguino and Neumann (2016), González-Eguino, M., & Neumann, M. B. (2016). Significant implications of permafrost thawing for climate change control. *Climatic Change*, 136(2), 381-388, find increases in damages (and thus an increase in the SCC) when integrating this tipping element into the PAGE09 and DICE-2013R, respectively. Looking at the collapse of the West Antarctic Ice sheet, Nicholls et al. (2008) find a potential for significant increases in costs (and thus the SCC) in FUND. Nicholls, R. J., Tol, R. S., & Vafeidis, A. T. (2008). Global estimates of the impact of a collapse of the West Antarctic ice sheet: an application of FUND. *Climatic Change*, 91(1), 171-191. Ceronisky et al. (2011) model three tipping points (collapse of the Atlantic Ocean Meridional Overturning Circulation, large scale dissociation of oceanic methane hydrates; and a high equilibrium climate sensitivity parameter), and finds a large increase in the SCC in some cases. Ceronisky, M., Anthoff, D., Hepburn, C., & Tol, R. S. (2011). *Checking the price tag on catastrophe: The social cost of carbon under non-linear climate response* (No. 392). ESRI working paper.

CO8-1

“moment” of a distribution’s shape. Each IAM parameter and the resulting SCC distributions have differing levels of variance (i.e., spread around the mean), skewness (i.e., a measure of asymmetry), and kurtosis (which, like skewness, is another descriptor of a distribution’s tail) as well as means.²⁰⁷ It is generally understood that people are risk averse in that they prefer input parameter distributions and (the resulting) SCC distributions with lower variances, holding the mean constant.²⁰⁸ While the IWG assumes a risk-neutral central planner by using a constant discount rate (setting the risk premium to zero), this assumption does not correspond with empirical evidence,²⁰⁹ current IAM assumptions,²¹⁰ the NAS (2017) recommendations, nor with the IWG’s own discussion (2010) of the possible values of the elasticity of the marginal utility of consumption. Evidence from behavioral experiments indicate that people and society are also averse to other attributes of parameter distributions – specifically to the thickness of the tails of distributions – leading to an additional ambiguity premium (Heal and Millner, 2014).²¹¹ Designing IAMs to properly account for the risk and ambiguity premiums from uncertain climate damages would increase the resulting SCC values they generate.

Even under the IWG’s current assumption of risk neutrality, the mean SCC from uncertainty propagation excludes the (real) option value of preventing marginal CO₂ emissions.²¹² Option value reflects the value of future flexibility due to uncertainty and irreversibility; in this case, the irreversibility of CO₂ emissions due to their long life in the atmosphere.²¹³ If society exercises the option of emitting an additional unit

²⁰⁷ Golub, A., & Brody, M. (2017). Uncertainty, climate change, and irreversible environmental effects: application of real options to environmental benefit-cost analysis. *Journal of Environmental Studies and Sciences*, 1-8; see Figure 1 in IWG (2016).

²⁰⁸ In other words, society prefers a narrow distribution of climate damages around mean level of damages X to a wider distribution of damages also centered on the same mean of X because they avoid the potential for very high damages even at the cost of eliminating the chance of very low damages.

²⁰⁹ IWG, 2010, at fn 22; Cai et al., 2016, *supra* note 193, at 521.

²¹⁰ The developers of each of the three IAMs used by the IWG (2010; 2013; 2016) assume a risk aversion society. Nordhaus and Sztorc, 2013, *supra*; Anthoff, D., & Tol, R. S. (2010). The Climate Framework for Uncertainty, Negotiation and Distribution (FUND): Technical description, Version 3.5. Available at www.fund-model.org; Anthoff, D., & Tol, R. S. (2014). The Climate Framework for Uncertainty, Negotiation and Distribution (FUND): Technical description, Version 3.8. Available at www.fund-model.org; Hope, C. (2013). Critical issues for the calculation of the social cost of CO₂: why the estimates from PAGE09 are higher than those from PAGE2002. *Climatic Change*, 117(3), 531-543.

²¹¹ According to Heal and Millner (2014), *supra*, there is an ongoing debate of whether ambiguity aversion is rational or a behavioral mistake. Given the strong possibility that this debate is unlikely to be resolved, the authors recommend exploring both assumptions.

²¹² Arrow, K. J., & Fisher, A. C. (1974). Environmental preservation, uncertainty, and irreversibility. *The Quarterly Journal of Economics*, 312-319; Dixit, A.K., Pindyck, R.S., 1994. *Investment Under Uncertainty*. Princeton University Press, Princeton, NJ; Traeger, C. P. (2014). On option values in environmental and resource economics. *Resource and Energy Economics*, 37, 242-252.

In the discrete emission case, there are two overlapping types of option value: real option value and quasi-option value. Real option value is the full value of future flexibility of maintaining the option to mitigate, and mathematically equals the maximal value that can be derived from the option to [emit] now or later (incorporating learning) less the maximal value that can be derived from the possibility to [emit] now or never. Traeger, C. P. (2014). On option values in environmental and resource economics. *Resource and Energy Economics*, 37, 242-252, equation 5. Quasi-option value is the value of future learning conditional on delaying the emission decision, which mathematically equals the value of mitigation to the decision maker who anticipates learning less the value of mitigation to the decision maker who anticipates only the ability to delay his/her decision, and not learning. *Id.* The two values are related, such that real option value can be decomposed into:

$$DPOV = \text{Max}\{QOV + SOV - \text{Max}\{NPV, 0\}, 0\} = \text{Max}\{QOV + SOV - SCC, 0\}$$

where DPOV is the real option value, QOV is quasi-option value, SOV is simple option value (the value of the option to emit in the future condition on mitigating now), and NPV is the expected net present value of emitting the additional unit or the mean SCC in our case. *Id.*

²¹³ Even if society drastically reduced CO₂ emissions, CO₂ concentrations would continue to rise in the near future and many impacts would occur regardless due to lags in the climate system. Pindyck, R. S. (2007). Uncertainty in environmental economics. *Review of environmental economics and policy*, 1(1), 45-65.

of CO2 emissions today, “we will lose future flexibility that the [mitigation] option gave” leading to possible “regret and...a desire to ‘undo’” the additional emission because it “constrains future behavior.”²¹⁴ Given that the SCC is calculated on the Business as Usual (BAU) emission pathway, option value will undoubtedly be positive for an incremental emission because society will regret this emission in most possible futures.

Though sometimes the social cost of carbon and a carbon tax are thought of as interchangeable ways to value climate damages, agencies should be careful to distinguish two categories of the literature. The first is the economic literature that calculates the optimal carbon tax in a scenario where the world has shifted to an optimal emissions pathway. The second is literature that assesses the social cost of carbon on the business-as-usual (BAU) emissions pathway; the world is currently on the BAU pathway, since optimal climate policies have not been implemented. There are currently no numerical estimates of the risk premium and option value associated with an incremental emission on the BAU emissions path. Although there are stochastic dynamic optimization models that implicitly account for these two values, they analyze *optimal*, sequential decision making under climate uncertainty.²¹⁵ By nature of being optimization models (instead of policy models), these complex models focus on calculating the optimal tax and not the social cost of carbon, which differ in that the former is the present value of marginal damages on the optimal emissions path rather than on the BAU emissions path.²¹⁶ While society faces the irreversibility of emissions on the BAU emissions path when abatement is essentially near zero (i.e., far below the optimal level even in the deterministic problem),²¹⁷ the stochastic dynamic optimization model must also account for a potential counteracting abatement cost irreversibility – the sunk costs of investing in abatement technology if we learn that climate change is less severe than expected – by the nature of being on the optimal emissions path that balances the cost of emissions and abatement. In the optimal case, uncertainty and irreversibility of abatement *can theoretically* lead to a lower optimal emissions tax, unlike the social cost of carbon. The difference in the implication for the optimal tax and the SCC means that the stochastic dynamic modeling results are less applicable to the SCC.

What can we learn from new literature on stochastic dynamic programming models?

Bearing in mind the limitations of stochastic dynamic modeling, some new research provides valuable insights that are relevant to calculation of the social cost of greenhouse gases. The new and growing stochastic dynamic optimization literature implies that the IWG’s SCC estimates are downward biased. The literature is made up of three models – real option, finite horizon, and infinite horizon models – of which the infinite time horizon (i.e., stochastic dynamic programming (SDP)) models are the most

²¹⁴ Pindyck (2007).

²¹⁵ Kann & Weyant, *supra*; Pindyck (2007), *supra*; Golub et al. (2014), *supra*.

²¹⁶ Nordhaus (2014) makes this difference clear when he clarifies that “With an optimized climate policy...the SCC will equal the carbon price...In the more realistic case where climate policy is not optimized, it is conventional to measure the SCC as the marginal damage of emissions along the actual path. There is some inconsistency in the literature on the definition of the path along which the SCC should be calculated. This paper will generally define the SCC as the marginal damages along the baseline path of emissions and output and not along the optimized emissions path.” Nordhaus, W. (2014). Estimates of the social cost of carbon: concepts and results from the DICE-2013R model and alternative approaches. *Journal of the Association of Environmental and Resource Economists*, 1(1/2), 273-312.

²¹⁷ On the BAU path, emissions far exceed their optimal level even without considering uncertainty. As a consequence, society is likely to regret an additional emission of CO2 in most future states of the world. Alternatively, society is unlikely to regret current abatement levels unless the extremely unlikely scenarios that there is little to no warming and/or damages from climate change.

CO8-1

comprehensive for analyzing the impact of uncertainty on optimal sequential abatement policies.²¹⁸ Recent computational advancements in SDP are helping overcome the need for strong simplifying assumptions in this literature for purpose of tractability. Traditionally, these simplifications led to unrealistically fast rates of learning – leading to incorrect outcomes – and difficulty in comparing results across papers (due to differing uncertain parameters, models of learning, and model types). Even so, newer methods still only allow for a handful of uncertain parameters compared to the hundreds of uncertain parameters in FUND and PAGE. Despite these limitations, the literature supports the above finding that the SCC, if anything, increases under uncertainty.²¹⁹

First, uncertainty increases the optimal emissions tax under realistic parameter values and modeling scenarios. While the impact of uncertainty on the optimal emissions tax (relative to the deterministic problem) depends on the uncertain parameters considered, the type of learning, and the model type (real option, finite horizon, and infinite horizon), the optimal tax clearly increases when tipping points or black swan events are included in stochastic optimization problems.²²⁰ For SDP models, uncertainty tends to strengthen the optimal emissions path relative to the determinist case even without tipping points,²²¹ and these results are strengthened under realistic preference assumptions.²²² Given that there is no counter-balancing tipping abatement cost,²²³ the complete modeling of climate uncertainty – which fully accounts for tipping points and fat tails – increases the optimal tax. Uncertainty leads to a stricter optimal emissions policy even if with irreversible mitigation costs, highlighting that the SCC would also increase when factoring in risk aversion and irreversibility given that abatement costs are very low on the BAU emissions path.

Second, given the importance of catastrophic impacts under uncertainty (as shown in the previous paragraph), the full and accurate modeling of tipping points and unknown knowns is critical when modeling climate change. The most sophisticated climate-economic models of tipping points – which include the possibility of multiple correlated tipping points in stochastic dynamic IAMs – find an increase in the optimal tax by 100%²²⁴ to 800%²²⁵ relative to the deterministic case without them. More realistic modeling of tipping points will also increase the SCC.

²¹⁸ Kann and Weyant, 2000, *supra*; Pindyck, 2007, *supra*; Golub et al., 2014, *supra*.

²¹⁹ Kann and Weyant, 2000, *supra*; Pindyck, 2007, *supra*; Golub et al., 2014, *supra*; Lemoine and Rudik, 2017, *supra*.

Comparing the optimal tax to the mean SCC is made further difficult by the frequent use of DICE as the base from which most stochastic dynamic optimization models are built. As a consequence, deterministic model runs are frequently the base of comparison for these models (Lemoine and Rudik, 2017).

²²⁰ The real options literature tends to find an increase in the optimal emissions path under uncertainty relative to the deterministic case (Pindyck, 2007), though the opposite is true when modelers account for the possibility of large damages (i.e., tipping point or black swan events) even with a risk-neutral society (Pindyck, 2007; Golub et al., 2014). Solving finite horizon models employing non-recursive methods, modelers find that the results differ depending on the model of learning – the research demonstrates stricter emission paths under uncertainty without learning (with emission reductions up to 30% in some cases) and the impact under passive learning has a relatively small impact due the presence of sunken mitigation investment costs - except when tipping thresholds are included (Golub et al., 2014).

²²¹ Using SDP, modelers find that uncertainty over the equilibrium climate sensitivity parameter generally increases the optimal tax by a small amount, though the magnitude of this impact is unclear (Golub et al., 2014; Lemoine and Rudik, 2017). Similarly, non-catastrophic damages can have opposing effects dependent on the parameters changed, though emissions appear to decline overall when you consider their uncertainty jointly.

²²² Pindyck, 2007; Golub et al., 2017; Lemoine and Rudik, 2017

²²³ Pindyck, 2007

²²⁴ Lemoine, D., & Traeger, C. P. (2016b). Economics of tipping the climate dominoes. *Nature Climate Change*.

²²⁵ Cai et al., 2016

CO8-1

Finally, improved modeling of preferences will amplify the impact of uncertainty on the SCC. Adopting Epstein-Zin preferences that disentangle risk aversion and time preferences can significantly increase the SCC under uncertainty.²²⁶ Recent research has shown that accurate estimation of decisions under uncertainty crucially depends on distinguishing between risk and time preferences.²²⁷ By conflating risk and time preferences, current models substantially understate the degree of risk aversion exhibited by most individuals, artificially lowering the SCC. Similarly, adopting ambiguity aversion increase the SCC, but to a much lesser extent than risk aversion.²²⁸ Finally, allowing for the price of non-market goods to increase with their relative scarcity can amplify the positive effect that even small tipping points have on the SCC if the tipping point impacts non-market services.²²⁹ Including more realistic preference assumptions in IAMs would further increase the SCC under uncertainty.

Introducing stochastic dynamic modeling (which captures option value and risk premiums), updating the representation of tipping points, and including more realistic preference structures in traditional IAMs will – as in the optimal tax – further increase the SCC under uncertainty

Conclusion: Uncertainty Raises the Social Cost of Greenhouse Gases

Overall, the message is clear: climate uncertainty is *never* a rationale for ignoring the SCC or shortening the time horizon of IAMs. Instead, our best estimates suggest that increased variability implies a higher SCC and a need for more stringent emission regulations.²³⁰ Current omission of key features of the climate problem under uncertainty (the risk and climate premiums, option value, and fat tailed probability distributions) and incomplete modeling of tipping points imply that the SCC will further increase with the improved modeling of uncertainty in IAMs.

CO8-1

²²⁶ Cai et al., 2016; Lemoine and Rudik, 2017. The standard utility function adopted in IAMs with constant relative risk version implies that the elasticity of substitution equals the inversion of relative risk aversion. As a consequence, the society's preferences for the intra-generational distribution of consumption, the intergenerational distribution of consumption, and risk aversion hold a fixed relationship. For purposes of stochastic dynamic programming, this is problematic because this assumption conflates intertemporal consumption smoothing and risk aversion. Botzen, W. W., & van den Bergh, J. C. (2014). Specifications of social welfare in economic studies of climate policy: overview of criteria and related policy insights. *Environmental and Resource Economics*, 58(1), 1-33. By adopting the Epstein-Zinn utility function which separates these two parameters, modelers can calibrate them according to empirical evidence. For example, Cai et al. (2016) replace the DICE risk aversion of 1.45 and elasticity parameter of 1/1.45 with values of 3.066 and 1.5, respectively.

²²⁷ James Andreoni & Charles Sprenger, *Risk Preferences Are Not Time Preferences*, 102 *AM. ECON. REV.* 3357–3376 (2012).

²²⁸ Lemoine, D., & Traeger, C. P. (2016b). Economics of tipping the climate dominoes. *Nature Climate Change*; Lemoine and Rudik, 2017

²²⁹ Typically, IAMs assume constant relative prices of consumption goods. Gerlagh, R., and B.C.C. Van der Zwaan. 2002. "Long-term substitutability between environmental and man-made goods." *Journal of Environmental Economics and Management* 44(2):329-345; Sterner, T., and U.M. Persson. 2008. "An Even Sterner Review: Introducing Relative Prices into the Discounting Debate." *Review of Environmental Economics and Policy* 2(1):61-76. By replacing the standard isoelastic utility function in IAMs with a nested CES utility function following Sterner and Persson (2008), Cai et al. (2015) find that even a relatively small tipping point (i.e., a 5% loss) can substantially increase the SCC in the stochastic dynamic setting. Cai, Y., Judd, K. L., Lenton, T. M., Lontzek, T. S., & Narita, D. (2015). Environmental tipping points significantly affect the cost–benefit assessment of climate policies. *Proceedings of the National Academy of Sciences*, 112(15), 4606-4611.

²³⁰ Golub et al. (2014) states "The most important general policy implication from the literature is that despite a wide variety of analytical approaches addressing different types of climate change uncertainty, none of those studies supports the argument that no action against climate change should be taken until uncertainty is resolved. On the contrary, uncertainty despite its resolution in the future is often found to favor a stricter policy."

Technical Appendix: Discounting

The Underlying IAMs All Use a Consumption Discount Rate

Employing a consumption discount rate would also ensure that the U.S. government is consistent with the assumptions employed by the underlying IAM models: DICE, FUND, and PAGE. Each of these IAMs employs consumption discount rates calibrated using the standard Ramsey formula (Newell, 2017). In DICE-2010, the elasticity of the pure rate of time preference is 1.5 and an elasticity of the marginal utility of consumption (η) of 2.0. Together with its assumed per capita consumption growth path, the average discount rate over the next three hundred years is 2.4%.²³¹ However, more recent versions of DICE (DICE-2013R and DICE-2016) update η to 1.45; this implies an increase of the average discount rate over the timespan of the models to between 3.1% and 3.2% depending on the consumption growth path.²³² In FUND 3.8 and (the mode values in) PAGE09, both model parameters are equal to 1.0. Based on the assumed growth rate of the U.S. economy (without climate damages), the average U.S. discount rate in FUND 3.8 is 2.0% over the timespan of the model (without considering climate damages). Unlike FUND 3.8, PAGE09 specifies triangular distributions for both parameters with a pure rate of time preference of between 0.1 and 2 with a mean of 1.03 and an elasticity of the marginal utility of consumption of between 0.5 and 2 with a mean 1.17. Using the PAGE09's mode values (without accounting for climate damages), the average discount rate over the timespan of the models is approximately 3.3% with a range of 1.2% to 6.5%. Rounding up the annual growth rate over the last 50 years to approximately 2%,²³³ the range of best estimates of the SDR implied in the short-run by these three models is approximately 3% (PAGE09's mode estimate and FUND 3.8) to 4.4% (DICE-2016), though the PAGE09 model alone implies a range of 1.1% to 6.0% with a central estimate of 3%. The range of potential consumption discount rates in these IAMs is relatively consistent with IWG (2010; 2013; 2016) in the short-run, though the discount rates of the IAMs employed by the IWG decline over time (due to declining growth rates over time) implying a potential upward bias to the IWG consumption discount rates.

A Declining Discount Rate is Justified to Address Discount Rate Uncertainty

A strong consensus has developed in economics that the appropriate way to discount intergenerational benefits is through a declining discount rate (Arrow et al., 2013; Arrow et al., 2014; Gollier & Hammit, 2014; Cropper et al., 2014).²³⁴ Not only are declining discount rate theoretically correct, they are actionable (i.e., doable given our current knowledge) and consistent with OMB's *Circular A-4*. Perhaps the best reason to adopt a declining discount rate is the simple fact that there is considerable uncertainty around which discount rate to use. The uncertainty in the rate points directly to the need to use a declining rate, as the impact of the uncertainty grows exponentially over time such that the

²³¹ Due to a slowing of global growth, DICE-2010 implies a declining discount rate schedule of 5.1% in 2015, 3.9% from 2015 to 2050; 2.9% from 2055 to 2100; 2.2% from 2105 to 2200, and 1.9% from 2205 to 2300. This would be a steeper decline if Nordhaus accounted for the positive and normative uncertainty underlying the SDR.

²³² Due to a slowing of global growth, DICE-2016 implies a declining discount rate schedule of 5.1% in 2015, 4.7% from 2015 to 2050; 4.1% from 2055 to 2100; 3.1% from 2105 to 2200, and 2.5% from 2205 to 2300.

²³³ According to the World Bank, the average global and United States per capita growth rates were 1.7% and 1.9%, respectively.

²³⁴ Arrow et al. (2014) at 160-161 states that "We have argued that theory provides compelling arguments for using a declining certainty-equivalent discount rate," and concludes the paper by stating "Establishing a procedure for estimating a [declining discount rate] for project analysis would be an improvement over the OMB's current practice of recommending fixed discount rates that are rarely updated."

CO8-1

correct discount rate is not an arithmetic average of possible discount rates.²³⁵ Uncertainty about future discount rates could stem from a number of sources particularly salient in the context of climate change, including uncertainty about future economic growth, consumption, the consumption rate of interest, and preferences. Additionally, economic theory shows that if there is debate or disagreement over which discount rate to use, this should lead to the use of a declining discount rate (Weitzman, 2001; Heal & Millner, 2014). Though, the range of potential discount rates is limited by theory to potential consumption discount rates (see earlier discussion), which is certainly less than 7%.

There is a consensus that declining discount rates are appropriate for intergenerational discounting

Since the IWG undertook its initial analysis and before the most recent estimates of the SCC, a large and growing majority of leading climate economists consensus (Arrow et al., 2013) has come out in favor of using a declining discount rate for climate damages to reflect long-term uncertainty in interest rates. This consensus view is held whether economists favor descriptive (i.e., market) or prescriptive (i.e., normative) approaches to discounting (Freeman et al., 2015). Several key papers (Arrow et al., 2013; Arrow et al., 2014; Gollier & Hammitt, 2014; Cropper et al., 2014) outline this consensus and present the arguments that strongly support the use of declining discount rates for long-term benefit-cost analysis in both the normative and positive contexts. Finally, in a recent survey of experts on the economics of climate change, Howard and Sylvan (2015), found that experts support using a declining discount rate relative to a constant discount rate at a ratio of approximately 2 to 1.

Economists have recently highlighted two main motivations for using a declining discount rate, which we elaborate on in what follows. First, if the discount rate for a project is fixed but uncertain, then the certainty-equivalent discount rate will decline over time, meaning that benefits should be discounted using a declining rate.²³⁶ Second, uncertainty about the growth rate of consumption or output also implies that a declining discount rate should be used, so long as shocks to consumption are positively correlated over time.²³⁷ In addition to these two arguments, other motivations for declining discount rates have long been recognized. For instance, if the growth rate of consumption declines over time, the Ramsey rule²³⁸ for discounting will lead to a declining discount rate.²³⁹

²³⁵ Karp (2005) states that mathematical “intuition for this result is that as [time] increases, smaller values of r in the support of the distribution are relatively more important in determining the expectation of e^{-rt} ” where r is the constant discount rate.” Or as Hepburn et al. (2003) puts it, “The intuition behind this idea is that scenarios with a higher discount rate are given less weight as time passes, precisely because their discount factor is falling more rapidly” over time.

²³⁶ This argument was first developed in Weitzman (1998) and Weitzman (2001).

²³⁷ See, e.g., Gollier (2009).

²³⁸ The Ramsey discount rate equation for the social discount rate is $r = \delta + \eta * g$ where r is the social discount rate, δ is the pure rate of time preference, η is the aversion to inter-generational inequality, and g is the growth rate of per capita consumption. For the original development, see, Ramsey, F. P. (1928). A Mathematical Theory of Saving. *The Economic Journal*, 38(152).

²³⁹ Higher growth rates lead to higher discounting of the future in the Ramsey model because growth will make future generations wealthier. If marginal utility of consumption declines in consumption, then, one should more heavily discount consumption gains by wealthier generations. Thus, if growth rates decline over time, then the rate at which the future is discounted should also decline. See, e.g., Arrow et al. (2014) at 148. It is standard in IAMs to assume that the growth rate of consumption will fall over time. See, e.g., Nordhaus (2017) at 1519, “Growth in global per capita output over the 1980–2015 period was 2.2% per year. Growth in global per capita output from 2015 to 2050 is projected at 2.1% per year, whereas that to 2100 is projected at 1.9% per year.” Similarly, Hope (2011) at 22 assumes that growth will decline. For instance, in the U.S., growth is 1.9% per year in 2008 and declines to 1.7% per year by 2040. Using data provided by Dr. David Anthoff (one of the founders of FUND), FUND assumes that the global growth rate was 1.8% per year from 1980–2015 period, 1.4% per year from 2015 to 2050 and 2015 to 2100, and then dropping to 1.0% from 2100 to 2200 and then 0.7% from 2200 to 2300.

In the descriptive setting adopted by the IWG (2010), economists have demonstrated that calculating the expected net present value of a project is equivalent to discounting at a declining certainty equivalent discount rate when (1) discount rates are uncertain, and (2) discount rates are positively correlated (Arrow et al., 2014 at 157). Real consumption interest rates are uncertain given that there are no multi-generation assets to reflect long-term discount rates and the real returns to all assets—including government bonds—are risky due to inflation and default risk (Gollier & Hammitt, 2014). Furthermore, recent empirical work analyzing U.S. government bonds demonstrates that they are positively correlated over time; this empirical work has estimated several declining discount rate schedules that the IWG can use (Cropper et al., 2014; 2014; Arrow et al., 2013; Arrow et al., 2014; Jouini and Napp, 2014; Freeman et al. 2015).

Currently when evaluating projects, the U.S. government applies the descriptive approach using constant rates of 3% and 7% based on the private rates of return on consumer savings and capital investments. As discussed previously, applying a capital discount rate to climate change costs and benefits is inappropriate (Newell, 2017). Instead, analysis should focus on the uncertainty underlying the future consumption discount rate (Newell, 2017). Past U.S. government analyses (IWG, 2010; IWG, 2013; IWG, 2016) modeled three consumption discount rates reflecting this uncertainty. If the U.S. government correctly returns its focus on multiple consumption discount rates, then the expected net present value argument given above implies that a declining discount rate is the appropriate way to perform discounting. As an alternative, given that the Ramsey discount rate approach is the appropriate methodology in intergenerational settings, the U.S. government could use a fixed, low discount rate as an approximation of the Ramsey equation following the recommendation of Marten et al. (2015); see our discussion on Martin et al. 2015). This is roughly IWG (2010)'s goal for using the constant 2.5% discount rate.

If the normative approach to discounting is used in the future (i.e., the current approach of IAMs), economists have demonstrated that an extended Ramsey rule²⁴⁰ implies a declining discount rate when (1) the growth rate of per capita consumption is stochastic,²⁴¹ and (2) consumption shocks are positively correlated over time (or their mean or variances are uncertain) (Arrow et al., 2013; Arrow et al., 2014; Gollier & Hammitt, 2014; Cropper et al., 2014).²⁴² While a constant adjustment downwards (known as

²⁴⁰ If the future growth of consumption is uncertainty with mean μ and variance σ^2 , an extended Ramsey equation $r = \delta + \eta * \mu - 0.5\eta^2\sigma^2$ applies where r is the social discount rate, δ is the pure rate of time preference, η is the aversion to inter-generational inequality, and g is the growth rate of per capita consumption. Gollier (2012, Chapter 3) shows that we can rewrite the extended discount rate as $r = \delta + \eta * g - 0.5\eta(\eta + 1)\sigma^2$ where g is the growth rate of expected consumption and $\eta + 1$ is prudence.

²⁴¹ The IWG assumption of five possible socio-economic scenarios implies an uncertain growth path.

²⁴² The intuition of this result requires us to recognize that the social planner is prudent in these models (i.e., saves more when faces riskier income). When there is a positive correlation between growth rates in per capita consumption, the representative agent faces more cumulative risk over time with respect to the "duration of the time spent in the bad state." (Gollier et al., 2008). In other words, "the existence of a positive correlation in the changes in consumption tends to magnify the long-term risk compared to short-term risks. This induces the prudent representative agent to purchase more zero-coupon bonds with a long maturity, thereby reducing the equilibrium long-term rate." (Gollier, 2007). Mathematically, the intuition is that under prudence, the third term in the extended Ramsey equation (see footnote 323) is negative, and a "positive [first-degree stochastic] correlation in changes in consumption raises the riskiness of consumption at date T, without changing its expected value. Under prudence, this reduces the interest rate associated to maturity T" (Gollier et al., 2007) by "increasing the strength of the precautionary effect" in the extended Ramsey equation (Arrow et al., 2014; Cropper et al., 2014).

CO8-1

the precautionary effect²⁴³) can be theoretically correct when growth rates are independent and identically distributed (Cropper et al., 2014), empirical evidence supports the two above assumptions for the United States, thus implying a declining discount rate (Cropper et al., 2014; Arrow et al., 2014; IPCC, 2014).²⁴⁴ We should further expect this positive correlation to strengthen over time due to the negative impact of climate change on consumption, as climate change causes an uncertain permanent reduction in consumption (Gollier, 2009).²⁴⁵

Several papers have estimated declining discount rate schedules for specific values of the pure rate of time preference and elasticity of marginal utility of consumption (e.g., Arrow et al., 2014), though recent work demonstrates that the precautionary effect increases and discount rates decrease further when catastrophic economic risks (such as the Great Depression and the 2008 housing crisis) are modeled (Gollier & Hammitt, 2014; Arrow et al., 2014). It should be noted that this decline in discount rates due to uncertainty in the global growth path is in addition to that resulting from a declining central growth path over time (Nordhaus, 2014; Marten, 2015).²⁴⁶

Additionally, a related literature has developed over the last decade demonstrating that normative uncertainty (i.e., heterogeneity) over the pure rate of time preference (δ)—a measure of impatience—also leads to a declining social discount rate (Arrow et al., 2014; Cropper et al., 2014; Freeman and Groom, 2016). Despite individuals differing in their pure rate of time preference (Gollier and Zeckhauser, 2005), an equilibrium (consumption) discount exists in the economy. In the context of IAMs, modelers aggregate social preferences (often measured using surveyed experts) by calibrating the preferences of a representative agent to this equilibrium (Millner and Heal, 2015; Freeman and Groom, 2016). The literature generally finds a declining social discount rate due to a declining collective pure rate of time preference (Gollier and Zeckhauser, 2005; Jouini et al., 2010; Jouini and Napp, 2014; Freeman and Groom, 2016).²⁴⁷ The heterogeneity of preferences and the uncertainty surrounding economic growth hold simultaneously (Jouini et al., 2010; Jouini and Napp, 2014), leading to potentially two sources of declining discount rates in the normative context.

Declining Rates are Actionable and Time-Consistent

²⁴³ The precautionary effect measures aversion to future “wiggles” in consumption (i.e., preference for consumption smoothing) (Traeger, 2014).

²⁴⁴ Essentially, the precautionary effect increases over time when shocks to the growth rate are positively correlated, implying that future societies require higher returns to face the additional uncertainty (Cropper et al., 2014; Arrow et al., 2014; IPCC, 2014).

²⁴⁵ Due to the deep uncertainty characterizing future climate damages, some analysts argue that the stochastic processes underlying the long-run consumption growth path cannot be econometrically estimated (Weitzman, 2007; Gollier, 2012). In other words, economic damages, and thus future economic growth, are ambiguous. Agents must then form subjectivity probabilities, which may be better interpreted as a belief (Cropper et al., 2014). Again, theory shows that ambiguity leads to a declining discount rate schedule by Jensen’s inequality (Cropper et al., 2014).

²⁴⁶ A common assumption in IAMs is that global growth will slow over time leading to a declining discount rate schedule over time; see footnote 7. Uncertainty over future consumption growth and heterogeneous preferences (discussed below) would lead to a more rapid decline in the social discount rate.

²⁴⁷ The intuition for declining discount rates due to heterogeneous pure rates of time preference is laid out in Gollier and Zeckhauser (2005). In equilibrium, the least patient individuals trade future consumption to the most patient individuals for current consumption, subject to the relative value of their tolerance for consumption fluctuations. Thus, while public policies in the near term mostly impact the most impatient individuals (i.e., the individuals with the most consumption in the near term), long-run public policies in the distant future are mostly going to impact the most patient individuals (i.e., the individuals with the most consumption in the long-run).

CO8-1

There are multiple declining discount rate schedules from which the U.S. government can choose, of which several are provided in Arrow et al. (2014) and Cropper et al. (2014). One possible declining interest rate schedule for consideration by the IWG is the one proposed by Weitzman (2001).²⁴⁸ It is derived from a broad survey of top economists in context of climate change, and explicitly incorporates arguments around interest rate uncertainty.²⁴⁹ Other declining discount rate schedule include Newell and Pizer (2003); Groom et al. (2007); Freeman et al. (2015). Many leading economists support the United States government adopting a declining discount rate schedule (Arrow et al., 2014; Cropper et al., 2014). Moreover, the United States would not be alone in using a declining discount rate. It is standard practice for the United Kingdom and French governments, among others (Gollier & Hammitt, 2014; Cropper et al., 2014). The U.K. schedule explicitly subtracts out an estimated time preference.²⁵⁰ France's schedule is roughly similar to the United Kingdom's. Importantly, all of these discount rate schedules yield lower present values than the constant 2.5% discount rate employed by IWG (2010), suggesting that even the lowest discount rate evaluated by the IWG is too high.²⁵¹ The consensus of leading economists is that a declining discount rate schedule should be used, harmonious with the approach of other countries like the United Kingdom. Adopting such a schedule would likely increase the SCC substantially from the administration's 3% estimate, potentially up to two to three fold (Arrow et al., 2013; Arrow et al., 2014; Freeman et al., 2015).

A declining discount rate motivated by discount rate or growth rate uncertainty avoids the time inconsistency problem that can arise if a declining pure rate of time preference (δ) is used. *Circular A-4* cautions that "[u]sing the same discount rate across generations has the advantage of preventing time-inconsistency problems."²⁵² A time inconsistent decision is one where a decision maker changes his or her plan over time, solely because time has passed. For instance, consider a decision maker choosing whether to make an investment that involves an up-front payment followed by future benefits. A time consistent decision maker would invest in the project if it had a positive net-present value, and that decision would be the same whether it was made 10 years before investment or 1 year before investment. A time inconsistent decision maker might change his or her mind as the date of the investment arrived, despite no new information becoming available. Consider a decision maker who has a declining pure rate of time preference (δ) trying to decide whether to invest in a project that has large up-front costs followed by future benefits. 10 years prior to the date of investment, the decision maker will believe that this project is a relatively unattractive investment because both the benefits and costs would be discounted at a low rate. Closer to the date of investment, however, the costs would be

²⁴⁸ Weitzman (2001)'s schedule is as follows: 4% for 1-5 years; 3% for 6-25 years; 2% for 26-75 years; 1% for 76-300 years; and 0% for 300+ years.

²⁴⁹ Freeman and Groom (2014) demonstrate that this schedule only holds if the heterogeneous responses to the survey were due to differing ethical interpretations of the corresponding discount rate question. A recent survey by Drupp et al. (2015) – which includes Freeman and Groom as co-authors – supports the Weitzman (2001) assumption.

²⁵⁰ The U.K. declining discount rate schedule that subtracts out a time preference value is as follows (Lowe, 2008): 3.00% for 0-30 years; 2.57% for 31-75 years; 2.14% for 76-125 years; 1.71% for 126- 200 years; 1.29% for 201- 300 years; and 0.86% for 301+ years.

²⁵¹ Using the IWG's 2010 SCC model, Johnson and Hope (2012) find that the U.K. and Weitzman schedules yield SCCs of \$55 and \$175 per ton of CO₂, respectively, compared to \$35 at a 2.5% discount rate. Because the 2.5% discount rate was included by the IWG (2010) to proxy for a declining discount rate, this result indicates that constant discount rate equivalents may be insufficient to address declining discount rates.

²⁵² *Circular A-4* at 35.

CO8-1

relatively highly discounted, possibly leading to a reversal of the individual's decision. Again, the discount rate schedule is time consistent as long as δ is constant.

The arguments provided here for using a declining consumption discount rate are not subject to this time inconsistency critique. First, time inconsistency occurs if the decision maker has a declining pure rate of time preference, not due to a decreasing discount rate term structure.²⁵³ Second, uncertainty about growth or the discount rate avoids time inconsistency because uncertainty is only resolved in the future, after investment decisions have already been made. As the NAS (2017) notes, "One objection frequently made to the use of a declining discount rate is that it may lead to problems of time inconsistency....This apparent inconsistency is not in fact inconsistent....At present, no one knows what the distribution of future growth rates...will be; it may be different or the same as the distribution in 2015. Even if it turns out to be the same as the distribution in 2015, that realization is new information that was not available in 2015."²⁵⁴

We should note that time-inconsistency is not a reason to ignore heterogeneity (i.e., normative uncertainty) over the pure rate of time preference (δ). If the efficient declining discount rate schedule is time-inconsistent, the appropriate solution is to select the best time-consistent policy. Millner and Heal (2014) do just this by demonstrating that a voting procedure – whereby the median voter determines the collective preference – is: (1) time consistent, (2) welfare enhancing relative to the non-commitment, time-inconsistent approach, and (3) preferred by a majority of agents relative to all other time-consistent plans. Due to the right skewed distribution of the pure rate of time preference and the social discount rate as shown in all previous surveys (Weitzman, 2001; Drupp et al., 2015; Howard and Sylvan, 2015), the median is less than the mean social discount rate (and pure rate of time preference); the mean social discount rate is what holds in the very short-run under various aggregation methods, such as Weitzman (2001) and Freeman and Groom (2015). Combining an uncertain growth rate and heterogeneous preference together implies a declining discount rate starting at a lower value in the short-run. In addition to the reasons discussed earlier in the comments, this is another reason to exclude a discount rate as high as 7%.

There is an economic consensus on the appropriateness of employing a consumption discount rate (and the inappropriateness of a capital discount rate) in the context of climate change

There is a strong consensus among economists that it is theoretically correct to use consumption discount rates in the intergenerational setting of climate change, such as in the calculation of the SCC. Similarly, there is a strong consensus that a capital discount rate is inappropriate according to "good economics" (Newell, 2017).²⁵⁵ This consensus holds across panels of experts on the social cost of carbon (NAS, 2017); surveys of experts on climate change and discount rates (Weitzman, 2001; Drupp et al.,

²⁵³ Gollier (2012) states "It is often suggested in the literature that economic agents are time inconsistent if the term structure of the discount rate is decreasing. This is not the case. What is crucial for time consistency is the constancy of the rate of impatience, which is a cornerstone of the classic analysis presented in this book. We have seen that this assumption is compatible with a declining monetary discount rate."

²⁵⁴ NAS Second Report, *supra* note 61, at 182.

²⁵⁵ The former co-chair of the National Academy of Sciences' Committee on Assessing Approaches to Updating the Social Cost of Carbon – Richard Newell (2017) – states that "[t]hrough the addition of an estimate calculated using a 7 percent discount rate is consistent with past regulatory guidance under OMB Circular A-4, there are good reasons to think that such a high discount rate is inappropriate for use in estimating the SCC...It is clearly inappropriate, therefore, to use such modeling results with OMB's 7 percent discount rate, which is intended to represent the historical before-tax return on private capital...This is a case where unconsidered adherence to the letter of OMB's simplified discounting approach yields results that are inconsistent with and ungrounded from good economics."

2015; Howard and Sylvan, 2015; and Pindyck, 2016); the three most commonly cited IAMs employed in calculating the federal SCC; and the government's own analysis (IWG, 2010; CEA, 2017). For more analysis of this issue, see the discussion in the main body our Comments on the inappropriateness using a discount rate premised on the return to capital in intergenerational settings.

CO8-1

CO (Companies and Organizations)

CO9 - Sierra Club

UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

In the Matter of
RIO GRANDE LNG, LLC
RIO BRAVO PIPELINE COMPANY, LLC

CP16-454-000
CP16-455-000

COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR THE
PROPOSED RIO GRANDE LNG TERMINAL AND RIO BRAVO PIPELINE

Save RGV from LNG, Shrimpers and Fisherman of the RGV, Sierra Club, and Vecinos para el Bienestar de la Comunidad Costera (collectively, "Commenters") submit these comments regarding the regarding the Federal Energy Regulatory Commission's ("FERC" or "the Commission") draft environmental impact statement ("DEIS") for the proposed Rio Grande LNG liquefied natural gas ("LNG") export terminal and associated Rio Bravo pipeline.

In Docket CP16-454, Rio Grande LNG, LLC ("Rio Grande") seeks authorization under section 3(a) of the Natural Gas Act, 15 U.S.C. § 717b(a), to site, construct and operate a new liquefied natural gas export and truck loading terminal near Brownsville, Texas, with a nameplate capacity of 3.6 billion cubic feet per day (bcf/d). In Docket CP16-455, Rio Bravo Pipeline Company, LLC ("Rio Bravo") proposes to site, construct, and operate infrastructure that will deliver natural gas feedstock to this export facility: two 140 mile, 42 inch pipelines, each with a capacity of 2.25 bcf/d, together with related compressor stations and other facilities. Rio Grande and Rio Bravo ("Applicants") have submitted a single application for these Projects, and FERC has provided a single DEIS covering both.

As commenters explain below, the DEIS for these Projects fails to satisfy the obligations imposed by the National Environmental Policy Act ("NEPA"). The DEIS contains numerous

CO9-1

CO9-1

The EIS was prepared in accordance with NEPA, CEQ guidelines, and the Commission's regulations and policy. The EIS is consistent with FERC style, formatting, and policy regarding NEPA evaluation of alternatives and different impact types. The EIS is comprehensive and thorough in its identification and evaluation of feasible mitigation measures to reduce those effects whenever possible. While some information was still pending at the time of issuance of the draft EIS, the lack of this final information does not deprive the public of a meaningful opportunity to comment on a substantial adverse environmental effect of the Project or a feasible way to mitigate or avoid such effect. The draft EIS included sufficient detail to enable the reader to understand and consider the issues raised by the proposed Project and addresses a reasonable range of alternatives. The final EIS includes additional information provided by RG Developers, cooperating agencies, and new or revised information based on substantive comments on the draft EIS.

informational gaps, and reaches multiple conclusions that lack support or are contrary to the available evidence. These deficiencies are severe enough that they must be corrected with a renewed draft EIS and a fresh opportunity for the public comment. Ultimately, however, it is clear that the Projects will have such severe adverse impacts on the local environment, surrounding communities, regions supplying the gas to be exported, and the climate as a whole, that the Projects are contrary to the public interest, cannot satisfy other applicable law, and must be denied.

CO9-1

CO9-2

CO9-2

Comment noted.

Table of Contents

- I. FERC Has Not Provided Sufficient Opportunity for Public Participation 4
 - A. The DEIS Is Missing Extensive Information Precluding the Opportunity for Meaningful Public Comment 4
 - B. FERC Has Not Provided Sufficient Opportunity for Public Comment..... 7
- II. The DEIS Does Not Demonstrate a Need for the Projects 7
- III. The DEIS Fails to Adequately Assess Impacts on Local Communities 9
 - A. Introduction..... 9
 - B. The DEIS Fails to Adequately Consider the Environmental Justice Impacts of the Rio Grande LNG Project 10
 - 1. The Rio Grande LNG Project Will Have Adverse Impacts on Low-Income and Minority Communities 10
 - 2. The DEIS Fails to Consider Impacts to Cameron County’s Tax Base 13
 - 3. The DEIS Fails to Consider Impacts to Public Health and Safety 16
 - 4. The DEIS Fails to Adequately Consider Impacts to Nearby Residential Property Values 18
 - 5. The DEIS Fails to Adequately Consider Impacts to Vehicular Traffic in its Vicinity 19
 - C. The DEIS Fails to Adequately Consider the Socioeconomic Impacts of the Rio Grande LNG Project..... 20
 - 1. Claims that the Project Will Increase Jobs and Create Positive In-flows into the Local Economy Fail to Fully Account for the Shocks to the Economy Created by the Construction Phases of the Project..... 20
 - 2. The Estimated Annual Economic Impact of the Projects Fails to Account for the Adverse Impacts of High-Paid, Skilled Workers on Low-Income Areas, Social Costs Incurred by Neighboring Communities, and Market Volatility 22

D. The DEIS Does Not Adequately Consider How the Environmental Degradation Caused by the Projects Will Likely Adversely Impact Local Industries 25

1. The DEIS Does Not Adequately Consider Adverse Impacts to Tourism 25
2. The DEIS Fails to Adequately Analyze the Project’s Impact on the Recreational Fishing Industry 31
3. The DEIS Does Not Adequately Consider the Adverse Impacts to the Commercial Fishing and Shrimping Industries, Including Impacts to Aquatic Species and Essential Fish Habitat, and Does Not Propose Meaningful Mitigation for These Impacts..... 32

IV. The DEIS Fails to Adequately Assess Impacts on Sensitive Species 40

- A. NEPA Obligations Respecting Wildlife and Listed Species..... 40
- B. The DEIS Fails to Adequately Assess the Project’s Significant Effects on Listed Species 43
 1. Endangered Ocelot 44
 2. Threatened Piping Plover and Red Knot..... 47
 3. Endangered and Threatened Sea Turtles 48
- C. The DEIS Fails to Adequately Assess Mitigation for Wildlife..... 52

V. The DEIS Fails to Take a Hard Look at Wetlands Impacts 53

- A. The DEIS Fails to Consider Reasonable Facility Design and Siting Alternatives That Would Reduce Wetland Impacts 53
- B. The DEIS Fails to Consider Alternatives Incorporating On-Site Mitigation of Wetland Impacts 57
- C. The DEIS Does Not Take a Hard Look at Potential Mitigation and Does Not Support the Conclusion That Wetland Impacts Will Be Mitigated to Insignificance 59
 1. The DEIS Arbitrarily Defers Discussion of Mitigation to Future Corps of Engineers Decisionmaking..... 60
 2. The Proposal to Mitigate Wetlands Impacts by Preserving Portions of the Loma Ecological Preserve Is Conceptually Flawed 61

VI. The DEIS Fails to Adequately Consider Reliability and Safety 63

- A. The Public Risk Impacts Analysis Related to the SpaceX Launch Facility Is Flawed ... 63
 1. The DEIS Discounts and Fails To Adequately Disclose the Risks Associated With the Nearby SpaceX Launch Facility..... 63
 2. FERC Must Clarify the Basis for Its Potential Impacts Analysis and Its Discrepancy with ACTA’s Conclusions 65
 3. The Risk Assessment for Space Launch Failures Improperly Failed To Include the BFR..... 65
 4. The DEIS Provides Insufficient Information Regarding Debris Impacts to the Brownsville Ship Channel..... 68

B. The DEIS' Reliability and Safety Analysis Is Incomplete and Fails to Account for All Reasonably Foreseeable Infrastructure 69

1. The DEIS Should Not Be Issued Until the DOT Issued Its Letter of Determination 70

2. The Safety Analysis Fails To Adequately Describe Potential Impacts from Collocated Pipelines on the Rio Grande LNG Terminal Site 71

3. The DEIS Fails to Demonstrate That Rio Grande LNG Will Exercise Sufficient Legal Control Over Activities at the Terminal Site 72

VII. The DEIS Fails to Adequately Consider Air Pollution and Associated Impacts 73

A. Construction Air Quality Impacts 73

B. Operational Air Quality Impacts 74

VIII. The DEIS Fails to Adequately Address Climate Change 75

IX. The DEIS Fails to Adequately Address Connected, Indirect, and Cumulative Actions, Including Production and Use of the Exported Gas 84

A. The EIS Must Address the Impacts of Cooperating Agencies' Decisions 84

B. The Effects of Increased Gas Production and Use Are Reasonably Foreseeable 87

1. The Proposed Projects Will Increase Gas Production 88

2. The Environmental Impacts of Increased Gas Production, Processing, and Transport are Reasonably Foreseeable 91

3. The Proposed Projects Will Increase Overseas Gas Use 93

C. DOE's Prior Analyses of Indirect Effects Are Insufficient 94

X. The DEIS Fails to Adequately Address Cumulative Impacts 96

XI. Conclusion 100

I. FERC Has Not Provided Sufficient Opportunity for Public Participation

A. The DEIS Is Missing Extensive Information Precluding the Opportunity for Meaningful Public Comment

The DEIS fails to satisfy NEPA's basic requirements because it omits analysis of many key issues, stating that these analyses are forthcoming. This precludes meaningful public involvement and violates NEPA.

NEPA serves to protect the environment by ensuring "clarity and transparency" to federal decisions affecting the environment. *North Carolina Wildlife Fed'n v. North Carolina Dept. of*

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CO9 - Sierra Club

Transp., 677 F.3d 596, 603 (4th Cir. 2012). Public participation is a two-way street, serving to inform the public and to allow the public to “play a role in the decision-making process.” *Id.* at 604–05. Enlisting the public serves to develop “high quality” information on “the issues that are truly significant to the action in question,” and to guide agencies to “take actions that protect, restore, and enhance the environment.” 40 C.F.R. §§ 1500.1, 1506.6 (public involvement), 1502.1 (purpose of impact statements).

Public participation cannot serve these purposes unless “relevant information is ... available to the public for comment.” *North Carolina Wildlife Fed’n*, 677 F.3d at 604–05 (quotation omitted). NEPA therefore requires that a draft of EIS be provided for public comment, and this draft “must fulfill and satisfy to the fullest extent possible the requirements established for final statements.” 40 C.F.R. § 1502.9(a). Under this requirement, agencies must “make available to the public high quality information, including accurate scientific analysis, expert agency comments and public scrutiny, before decisions are made and actions are taken.” *Ctr. for Biological Diversity v. U.S. Forest Serv.*, 349 F.3d 1157, 1167 (9th Cir. 2003). The agency “should take to the public the full facts in its draft EIS and not change them after the comment period unless, of course, the project itself is changed.” *Burkey v. Ellis*, 483 F. Supp. 897, 915 (N.D. Ala. 1979).

Here, FERC’s decision to release the DEIS is premature, because analyses of numerous environmental issues are, by FERC’s own admission, incomplete. The Fish and Wildlife Service recently submitted a letter enumerating many of these missing documents or analyses, identifying the following:¹

1. RG Developers' Plan and Procedures,
2. Spill Prevention, Control, and Countermeasure Plan,

¹ Comment of Fish and Wildlife Service (Nov. 27, 2018), Accession No. 20181127-0012.

CO9-3

See Comment Letter APP1, which includes RG Developers’ responses to the identified FWS letter. While some information was still pending at the time of issuance of the draft EIS, the lack of this final information does not deprive the public of a meaningful opportunity to comment on a substantial adverse environmental effect of the Project or a feasible way to mitigate or avoid such effect. The draft EIS included sufficient detail to enable the reader to understand and consider the issues raised by the proposed Project and addresses a reasonable range of alternatives.

In response to the ongoing Section 106 consultation, the Courts have upheld the Commission’s practice of issuing a conditioned Order (see *Del. Riverkeeper Network v FERC*). It is standard practice for a Commission Order to include a condition that construction may not proceed until after the National Historic Preservation Act (NHPA) Section 106 compliance process has been completed. This practice is also upheld by the courts (see *Grapevine v Federal Aviation Administration [FAA]*). We summarize our compliance with Section 106 in section 4.10 of the EIS, which stated that the Section 106 process would be completed when the FERC affords the Advisory Council on Historic Preservation (ACHP) an opportunity to comment if historic properties would be adversely affected.

As described in section 3.4 of the EIS, RG LNG originally proposed a new 1.8-mile-long temporary haul road to transport fill material from the Port Isabel dredge pile to the LNG Terminal site. We recommended in the draft EIS that RG LNG conduct a feasibility assessment for transporting fill material from the Port Isabel dredge pile to the LNG Terminal site via the existing system of roads or via barges. As a result of these assessments, RG LNG is no longer pursuing use of the temporary haul road.

CO9-3

3. Stormwater Pollution Prevention Plan,
4. RG LNG's Dredged Material Management Plan,
5. RB Pipeline completed pre-construction vegetation surveys for the preferred routes of Pipeline 1 and Pipeline 2 and work corridor,
6. RG Developers' Migratory Bird Conservation Plan,
7. FERC's recommendation that RG Developers consult with the Natural Resource Conservation Service and our agency to develop a final seed mix to be used in areas to be restored. The Service also recommends requiring a post-construction, and a monitoring plan for restored areas.
8. Coordination with Texas Parks and Wildlife Department for identification of impacts to, and implementation of Texas Tortoise best management practices,
9. Texas Coastal Management Plan concurrence documentation,
10. Documentation that the RB Pipeline route would avoid National Wildlife Refuge lands,
11. Final surveys and completion of consultation under Section 106 of the National Historic Preservation Act,
12. Final, approved plan by RG Developers' to FERC and State Historic Preservation Office for addressing unanticipated discovery of cultural resources or human remains during construction,
13. Site-specific measures to mitigate noise impacts from 24-hour horizontal directional drill activities near identified noise sensitive areas (NSAs),
14. Approved alternative to RG LNG's proposed, 1-mile-long, temporary haul road through wetlands.

CO9-3

On the last item, in particular, we emphasize that we strongly support the DEIS's determination that the temporary haul road should be avoided if possible. However, additional information about the proposed alternatives (use of existing roads or barges) should have been included in the DEIS and made available for public comment. Other missing documents include analysis of:

- Essential Fish Habitat consultation with National Marine Fisheries Services
- Numerous reliability and safety analyses
- Analyses of impacts to endangered and threatened species,
- Details of proposed compensatory mitigation for wetlands

By circulating a DEIS without this information, FERC has violated NEPA's requirement that the DEIS satisfy the requirements of the final EIS to the fullest extent possible, and FERC has

limited the public’s ability to meaningfully review and comment.

CO9-3

B. FERC Has Not Provided Sufficient Opportunity for Public Comment

FERC has further failed to provide the public with sufficient opportunity to weigh in on the DEIS. FERC set the public comment period at the regulatory minimum of 45 days. However, the majority of this period (31 days) overlaps with the 45 day comment period on the similar and neighboring Texas LNG proposal, which will affect the same communities. *See* 83 Fed. Reg. 55156 (Nov. 2, 2018) (comment period on Texas LNG closes Dec. 17, 2018). Indeed, FERC provided only a single public comment session in the community closest to the terminal site, Port Isabel, encompassing both projects. This required members of the public to review and prepare remarks on both projects simultaneously. Because these overlapping comment periods effectively interfere with one another, FERC has not provided sufficient opportunity for public comment on either project.

The format of the public comment sessions further frustrated meaningful public involvement. Rather than adopt a traditional public hearing, FERC’s public comment sessions required individuals to speak one-on-one to a court reporter, isolated from their supporting community and in an intimidating environment.

II. The DEIS Does Not Demonstrate a Need for the Projects

Neither the Applicants nor the DEIS demonstrate a need for or useful purpose served by the terminal or pipeline Projects.

Rio Grande has not demonstrated that it has customers interested in purchasing LNG. Rio Grande committed to filing “all long-term, binding contracts associated with the export of LNG from its facility, once executed” with the Department of Energy, as recognized in the

CO9-4

CO9-4

As described in section 1.1 of the EIS, the DOE granted an authorization to RG LNG for export to countries having an FTA with the United States that includes national treatment for trade in natural gas. RB Pipeline executed a precedent agreement for the total capacity of the Rio Bravo Pipeline for the 20-year life of the Project. FERC considers the public interest of LNG projects under Section 3 of the NGA and the public convenience and necessity of pipeline projects under Section 7 of the NGA prior to making its decision on whether or not to approve it. Assessment of the proposed Project has included coordination with multiple federal and state agencies (including the DOE who authorizes the exportation of the commodity) and requires permits or authorizations from additional entities (see section 1.5).

Department's order authorizing exports to FTA countries.² Rio Grande must similarly file all contracts associated with long-term supply of gas.³ These contracts must be filed "within 30 days of their execution."⁴ To date, no filings indicating either type of such contract appear on the DOE docket.⁵ Nor does the DEIS provide other evidence of market need or support for this project.

Evaluation of the state of global LNG markets indicates that Rio Grande is unlikely to acquire such contracts. The Energy Information Administration provides estimates of global demand for U.S. LNG as part of the agency's Annual Energy Outlook. The most recent outlook forecasts that this demand will peak at 5.28 trillion cubic feet per year, or 14.5 billion cubic feet per day.⁶ Other LNG export facilities that are already operational or under construction have capacity to saturate this demand. Together with proposed expansions, these facilities provide 15.35 bcf/d of capacity.⁷

Commenters recognize that a private consultant, NERA Economic Consulting, hired by the Department of Energy to assess the macroeconomic impacts of U.S. LNG exports recently provided a much higher estimate of global demand.⁸ As Sierra Club explained in comments on the NERA report, that report relied on numerous flawed assumptions that caused it to overstate global gas demand. Most severely, the report unrealistically and myopically assumed that, in the most likely scenario, no other nation takes *any* further action to limit greenhouse gas emissions.⁹ This

CO9-4

² <https://www.energy.gov/sites/prod/files/2016/08/f33/ord3869.pdf> at 5.

³ *Id.* at 8.

⁴ *Id.* at 8.

⁵ <https://www.energy.gov/fe/downloads/rio-grande-lng-llc-dkt-no-15-190-lng>, last visited Nov. 29, 2018.

⁶ EIA, Annual Energy Outlook 2018 at 73, attached as Exhibit 1, available at <https://www.eia.gov/outlooks/aeo/pdf/AEO2018.pdf>; see also *id.* Table 13, attached as Exhibit 2, available at https://www.eia.gov/outlooks/aeo/excel/aeotab_13.xlsx.

⁷ Approved facilities include Sabine Pass, Louisiana; Corpus Christi, Texas; Freeport, Texas; Cameron LNG, Louisiana; Dominion Cove Point, Maryland; and Southern LNG, Georgia. See <https://ferc.gov/industries/gas/industry/act/lng/lng-approved.pdf?csrt=1447583269565644927>. These facilities' combined capacity (including capacity that is already completed and therefore not included in FERC's "under construction" list), attached as Exhibit 3.

⁸ NERA Economic Consulting, *Macroeconomic Outcomes of Market Determined Levels of U.S. LNG Exports* (June 7, 2018), available at <https://fossil.energy.gov/app/docketindex/docket/index/10>

⁹ See *id.* at 41-43.

assumption runs counter to the rest of the world’s affirmation of the Paris Climate Accords and commitment to take action on climate change.

Insofar as there is no need for the proposed LNG exports, there is no need for the pipeline either. However, even if FERC determines that there is a need for the terminal, the DEIS does not demonstrate the need for a pipeline capable of delivering 4.5 bcf/d of gas, DEIS 1-4, when the terminal’s proposed capacity is only 27 mpta of LNG, *id.*, “equivalent to approximately 1,318 billion cubic feet per year (Bcf/yr) of natural gas (approximately 3.6 billion cubic feet per day (Bcf/d)).”¹⁰

CO9-4

III. The DEIS Fails to Adequately Assess Impacts on Local Communities

A. Introduction

The National Environmental Policy Act (NEPA) requires an environmental impact assessment (EIS) to examine all potential impacts of a project, including “ecological . . . aesthetic, historic, cultural, economic, social, or health, whether direct, indirect, or cumulative.”¹¹ Agencies must consider the environmental justice impacts of their actions on low-income, minority communities in accordance with Executive Order 12898.¹² The socioeconomic costs of a project related to physical environmental impacts, including reductions in property values, must also be analyzed. These analyses include examining “purely economic” impacts—for example, the loss of businesses in the project area—and effects that branch from racial insensitivity or economic inequality.¹³ The analysis must also consider problems related to the displacement or relocation of people.¹⁴

¹⁰ DOE Order 3869 at 1 (Aug. 17, 2016), attached as Exhibit 4.

¹¹ 40 C.F.R. § 1508.8.

¹² *Coliseum Square, Inc. v. Jackson*, 465 F.3d 215, 232 (5th Cir. 2006).

¹³ *Coliseum Square*, 465 F.3d at 234.

¹⁴ *Coliseum Square*, 465 F.3d at 232.

Below, we highlight the shortcomings and inconsistencies of the DEIS's treatment of the adverse environmental justice, socioeconomic, and fisheries impacts of the Rio Grande LNG Projects. In terms of environmental justice impacts, we first demonstrate that the Rio Grande LNG Project primarily and disproportionately affects low-income, minority communities. Then, we illustrate how the DEIS fails to consider impacts to Cameron County's tax base, public health and safety, nearby residential property values, and increased vehicular traffic.

In terms of socioeconomic impacts, we first illustrate why the DEIS's economic analysis regarding the LNG Terminal and Pipeline Systems proposals does not adequately consider its economic impact. This includes showing why claims that the Projects will increase jobs fail to account for the shocks the projects will create on the local economy, why the estimated annual impact of the Projects fails to account for a number of adverse impacts, and how the estimated generation of property taxes over the Projects' first 22 years of operation does not mitigate the impact of the tax breaks given to the project. Second, we show why how the environmental degradation caused by the Projects will adversely impact local industries, including tourism, recreational fishing and commercial fishing.

B. The DEIS Fails to Adequately Consider the Environmental Justice Impacts of the Rio Grande LNG Project

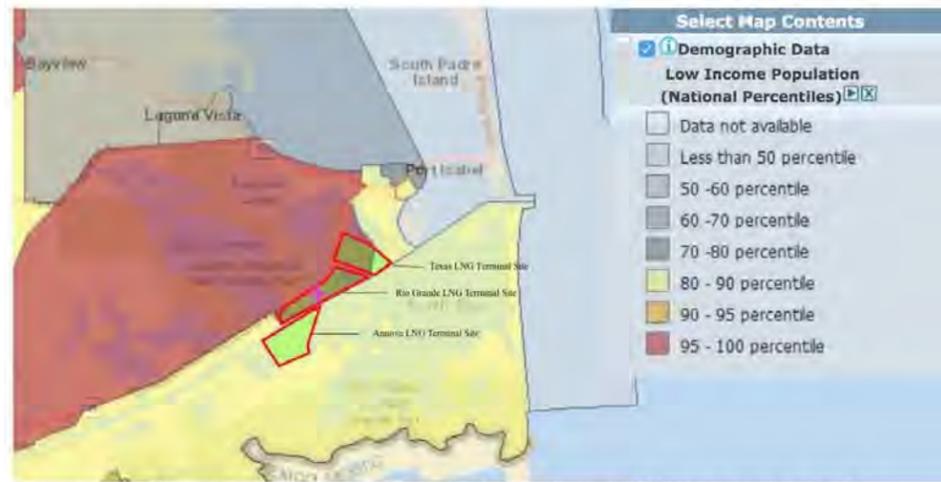
1. The Rio Grande LNG Project Will Have Adverse Impacts on Low-Income and Minority Communities

The neighborhoods in the area affected by the LNG facility Project are majority minority and low-income communities.¹⁵ The DEIS notes that the blocks closest to the LNG Terminal are "environmental justice populations."¹⁶ Cameron County is a majority-minority county, with non-

¹⁵ DEIS 4-225.

¹⁶ *Id.*

White people making up 91.1% of the population.¹⁷ As the DEIS acknowledges, the Project would be located in the “poorest metro area ... in the country.”¹⁸ 87.5% of students served by Port Isabel Independent School District (Port Isabel ISD) are economically disadvantaged, and 37.8% of students in Port Isabel ISD schools are English Language Learners.¹⁹

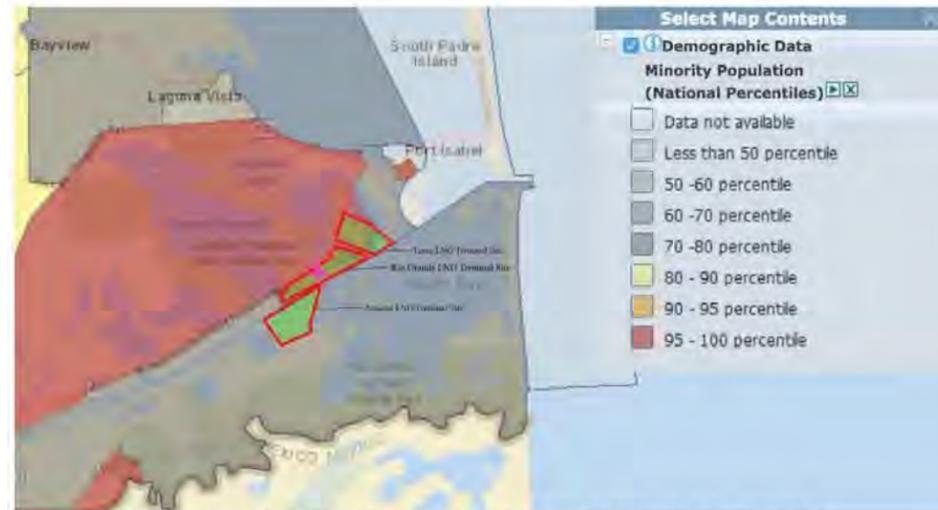


Terminal Site Demographics: Low Income Population (Source: EJScreen mapping tool)

¹⁷ “QuickFacts: Cameron County, Texas.” United States Census Bureau, accessed November 13, 2018, attached as Exhibit 5. **Error! Reference source not found.**
¹⁸ Rio Grande LNG Project Rio Bravo Pipeline Project, Resource Report 5: Socioeconomics, RR 5-11.
¹⁹ 2016 - 2017 Texas Academic Performance Report: Port Isabel ISD, attached as Exhibit 6, available at https://rptsvr1.tea.texas.gov/cgi/sas/broker?_service=marykay&year4=2017&year2=17&_debug=0&single=N&title=2017+Texas+Academic+Performance+Reports&_program=perfrpt.perfinast.sas&prgopt=2017%2Ftapr%2Ftapr.sas&ptype=P&level=district&search=district&namenum=isabel&district=031909, accessed November 20, 2018.

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Terminal Site Demographics: Minority Population (Source: EJScreen mapping tool)

In addition, the DEIS fails to consider the environmental justice impacts of the pipeline portion of the Project. The Project pipeline will connect to a hub in Agua Dulce, Texas, which has a population that is 99.2% Hispanic or Latino²⁰ and where 53.3% of the households are below the poverty level.²¹ In Agua Dulce, Kenedy County, and at the terminal site, the Project will include 180,000-horsepower compressor stations along the pipeline.²² According to multiple reports analyzing the effects of compressor stations on nearby residents, “people [...] experience[] ... symptoms ranging from skin rashes to gastrointestinal, respiratory, neurological and psychological problems.”²³

CO9-5

There are other risks as well for those living near the site of the pipeline. If pipelines leak,

CO9-6

²⁰ “Community Facts: Agua Dulce CDP, Texas,” Hispanic or Latino by Type: 2010, United States Census Bureau, accessed November 26, 2018, attached as Exhibit 7.

²¹ “Community Facts: Agua Dulce CDP, Texas,” Selected Economic Characteristics: 2012 – 2016 American Community Survey 5-Year Estimates, United States Census Bureau, accessed November 26, 2018, attached as Exhibit 8.

²² DEIS, 2-22.

²³ Barbara Gottlieb and Larysa Dryszka, MD, Physicians for Social Responsibility, *Too Dirty, Too Dangerous: Why health professionals reject natural gas*, (Feb. 2017), p. 22, attached as Exhibit 9, available at <https://www.psr.org/wp-content/uploads/2018/05/too-dirty-too-dangerous.pdf>.

CO9-5

Impacts on minority and low-income populations in proximity to the Pipeline System are addressed in section 4.9.10.2. As further discussed in that section, aside from temporary, minor traffic delays during peak construction times, the pipeline facilities are not expected to have disproportionate, adverse effects on minority and low-income residents in the area. As described in section 4.11.1 of the EIS, the State of Texas requires a State Health Effects air quality analysis. Pollution emissions from the proposed new compressor stations, when considered with background concentrations, would be below the NAAQS, which are designated to protect public health including sensitive populations such as children, the elderly, and asthmatics.

CO9-6

Section 4.11.1 quantifies air emissions from the Project, including fugitive and vented blowdown emissions. Impacts on air quality resulting from operation of the pipelines would not cause or significantly contribute to an exceedance of the NAAQS.

for example, local residents could be exposed to toxic substances.²⁴ In a “blowdown” procedure, where a pipeline vents gases “to control pressure and empty the system,” a pipeline “can emit ... much higher concentrations than annual emissions data would suggest.”²⁵ The DEIS failed to consider these risks to the communities living along the route.

CO9-6

2. The DEIS Fails to Consider Impacts to Cameron County’s Tax Base

Rio Grande LNG estimates that the LNG Terminal would generate circa \$92.9 million in property taxes in the affected counties over the first 22 years of operation, inclusive of applicable tax abatements, which should result in a moderate, positive, long-lasting impact on the local economy. While that seems like a large number initially, it pales in comparison to the ten-year tax abatement that Cameron County commissioners granted Rio Grande LNG in October 2017. The County promised the company a 76% break over ten years, or \$373.1 million.²⁶ In lieu of taxes, Rio Grande LNG agreed to pay the county 2.7 million a year in PILOT payments (payments in lieu of taxes), as well as provide up to \$10 million to fund community projects to maximize the hiring of local residents during construction.²⁷

Provided the estimate in the DEIS accounts for the 27% of taxes that Rio Grande LNG will be paying, the county still loses close to \$200 million in tax revenue — more than the county’s entire 2018 budget.²⁸ This is a massive loss, given the significant increase in public services that additional tax revenues could provide in one of the most impoverished counties in the country, one whose budget is often disproportionately tied down by international bridge

CO9-7

²⁴ *Id.* at 21.

²⁵ *Id.*

²⁶ Luis Montoya, “Cameron County gives Rio Grande LNG a \$373,100,000.00 tax break,” Rio Grande Guardian, Oct. 4, 2017, attached as Exhibit 10, available at <https://riograndeguardian.com/cameron-county-gives-rio-grande-lng-a-373100000-00-tax-break/>.

²⁷ Frank Garza, *LNG, Cameron County settle on terms*, The Monitor (Oct. 9, 2017), Exhibit 11, available at https://www.themonitor.com/news/article_e191551e-ad41-11e7-8822-33c38240f203.html.

²⁸ Cameron County, Texas: Commissioners’ Court, Approved Budget Fiscal Year 2017 - 2018, Oct. 1, 2017, attached as Exhibit 12, available at <http://www.co.cameron.tx.us/BudgetInfo/Adopted%20Budget%202018.pdf>.

CO9-7

As discussed further in section 4.9.5, the estimated tax benefits presented within assume the Project would receive tax abatements comparable to those recently granted for other LNG and major refining and petrochemical facilities along the Texas Gulf Coast. Further, RG LNG has committed to annual payments of \$2.7 million during the first 10 years of operation to offset a portion of the forgone taxes associated with the abatement. Also, as discussed further in section 4.9.7, the influx of temporary and permanent workers to the Project are would result in nominal increases in the total population requiring public services such as school, police, fire, and medical. Under the worst-case scenario, the Project would increase school enrollment by less than 5 percent and the student-to-teacher ratio would increase by less than 1 percent.

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maintenance and abnormally high law enforcement costs.²⁹ Meanwhile, welfare and health expenditures, for instance, represent a combined total of 7.1% of county expenditures yearly.³⁰

Taxes from massive projects like these, if nothing else, could provide Cameron County with significant revenue to invest in public services. But not only does the DEIS fail to acknowledge the lost tax revenue, it also fails to adequately document how that lost revenue and the demands of the project will financially strain local public services. In addition, the DEIS fails to consider how the high number of out-of-state contractors employed during the projects' construction phases over the estimated seven-year construction span will also add strain to the area's public services.

For example, while the DEIS acknowledges that a larger workforce will increase the number of students in local public schools,³¹ the DEIS also states these impacts could be mitigated by increased tax revenue, allowing schools to hire more teachers.³² Unfortunately, this view fails to acknowledge the immediate strain on school occupancy limitations in light of the Project's massive tax abatement, which could lead to fewer dollars per student invested in local public schools. The strain caused to local schools was publicly debated when school board members with the Port Isabel Independent School District (PISD) rejected a tax abatement for Rio Grande LNG in September 2016.³³ However, this effort was effectively defeated when the Commissioner's Court granted a tax abatement of their own the following year. The strain on school funding is particularly problematic because Laguna Heights schools are within the PISD, and given the high poverty rates in Laguna Heights, any impact to educational opportunities could

²⁹ *Id.*

³⁰ *Id.*

³¹ DEIS, 4-217.

³² *Id.*

³³ Sergio Chapa, *LNG opponents plan to protest NextDecade stockholders meeting*, San Antonio Business Journal (Jun. 14, 2018), attached as Exhibit 13, available at <https://www.bizjournals.com/sanantonio/news/2018/06/14/lng-opponents-plan-to-protest-nextdecade.html>.

CO9-8

As discussed further in section 4.9.7, the influx of temporary and permanent workers to the Project area would result in nominal increases in the total population requiring public services such as school, police, fire, and medical. Under the worst-case scenario, the Project would increase school enrollment by less than 5 percent and the student-to-teacher ratio would increase by less than 1 percent. Increased need for emergency services such as police, fire, and medical was also found to be minor and would be offset by RG LNG's commitments to train a portion of the construction and operation workforces as emergency responders and to hire onsite security.

CO9-7

CO9-8

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further cement income inequality throughout Cameron County.³⁴

CO9-8

Similarly, the DEIS claims that the “temporary, minor increase” of area residents during the construction phases of the Projects would not have an adverse impact on hospitals in the surrounding area because the ratio of residents to beds will only increase by 0.6.³⁵ However, this is an oversimplification of the strain the Projects and resulting uptick in environmental degradation will impose on health care services. For instance, the DEIS acknowledges that the construction phases of the Project will “impact local air quality,”³⁶ and “concurrent emissions...could result in exceedances of the NAAQS in the immediate vicinity of the LNG Terminal during” construction.³⁷

CO9-9

With impacts like these in mind, simply calculating the ratio of residents to hospital beds in the DEIS does not help determine whether a decrease in air quality could lead to an increase in demand for medical services. Even minor damage to, for instance, the area’s air quality, must be seen in conjunction with the existing environmental conditions of Cameron County. The County already ranks 227 out of 242 counties in Texas for its poor air quality, water quality, and other environmental metrics.³⁸ Cumulative impacts from the Terminal, the Pipeline System Project, and supporting industries, *e.g.*, freight, could exponentially increase environmentally-influenced health issues. This could, in turn, also exponentially increase the demand for medical services.

If a scenario such as this one plays out during the construction phases of the Projects, communities closest to the Projects would have to travel to medical facilities in Brownsville in

³⁴ Nathan Grawe, *Education and Economic Mobility*, The Urban Institute (Apr. 3, 2008), p. 18, attached as Exhibit 14, available at <https://www.urban.org/sites/default/files/publication/31161/1001157-education-and-economic-mobility.pdf> (demonstrating that while research is in its early stages, improved K-12 school quality increases economic mobility).

³⁵ See DEIS, 4-217.

³⁶ DEIS, 4-249.

³⁷ DEIS, ES-12.

³⁸ “Cameron County: County Health Rankings,” from County Health Rankings & Roadmaps, attached as Exhibit 15, available at <http://www.countyhealthrankings.org/app/texas/2018/rankings/cameron/county/factors/overall/snapshot>.

CO9-9

As stated in section 4.13.2.9 of the EIS, cumulative construction emissions would not be expected to result in a long-term impact on regional air quality. During operations, the location where the 1-hour NO₂ NAAQS could be exceeded if the Brownsville LNG terminals are approved, is between the fencelines of the Rio Grande LNG and Texas LNG Terminals. Therefore, it is unlikely, but possible, that people may be exposed to the NO₂ concentrations above the 1-hour NAAQS. Concentrations of 1-hour NO₂ in residential areas are estimated to be well below the 1-hour NAAQS.

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case of health emergencies, since Port Isabel and Laguna Madre have no hospitals.³⁹ The lack of public financial resources caused by the tax abatement strain Brownsville medical facilities that may not be equipped to handle increased foot traffic. It may also prevent the construction of new facilities in Port Isabel and/or Laguna Madre if health needs become acute.

CO9-9

3. The DEIS Fails to Consider Impacts to Public Health and Safety

Cameron County ranks 227 out of 242 counties in Texas for physical environment (air pollution, water quality, etc.).⁴⁰ Air pollution can worsen symptoms of respiratory diseases like asthma.⁴¹ Cumulative impacts from multiple pipelines, multiple terminals, and supporting industry will likely to exacerbate the health problems affecting these communities. The DEIS fails to provide adequate analysis on whether the increase in pollutants is likely to increase health problems and hospital visits.

CO9-10

Despite acknowledging that “[t]he construction of the Project would impact local air quality”⁴² and that “[c]oncurrent emissions ... could result in exceedances of the NAAQS in the immediate vicinity of the LNG Terminal during” construction,⁴³ the DEIS concludes that there will not be any “disproportionately high or adverse environmental and human health impacts on low-income and minority populations from construction or operation of the Project.”⁴⁴

The DEIS has no analysis on whether a decrease in air quality might lead to an increase in demand for medical services, such as asthma treatments. By only considering the ratio of residents to hospital beds, the DEIS fails to adequately consider the Projects’ impacts on health

CO9-11

³⁹ Rio Grande LNG Project Rio Bravo Pipeline Project, Resource Report 5: Socioeconomics, RR 5-102.

⁴⁰ “Cameron County: County Health Rankings,” attached as Exhibit 15.

⁴¹ Asthma and Allergy Foundation of America, *Asthma Capitals 2018: The Most Challenging Places to Live With Asthma*, (2018), p. 18, attached as Exhibit 16, available at <http://www.aafa.org/media/2119/aafa-2018-asthma-capitals-report.pdf>

⁴² DEIS, 4-249.

⁴³ DEIS, ES-12.

⁴⁴ DEIS, 5-12.

CO9-10

As described in section 4.11.1 of the EIS, the State of Texas requires a State Health Effects air quality analysis. The results of RG LNG’s State Health Effects modeling evaluation indicate that the Project emissions are below applicable effects screening levels, and therefore adverse health effects are not expected. The TCEQ is the agency responsible for the review of the State Health Effects analysis, and on December 17, 2018, the TCEQ issued an order granting air quality permits to RG LNG. Further, potential pollution emissions from the LNG Terminal site, when considered with background concentrations, would be below the NAAQS, which are designated to protect public health including sensitive populations such as children, the elderly, and asthmatics. Cumulative impacts on air quality are addressed in section 4.13.2.9 of the EIS.

CO9-11

As described in section 4.11.1 of the EIS, the State of Texas requires a State Health Effects air quality analysis. The results of RG LNG’s State Health Effects modeling evaluation indicate that the Project emissions are below applicable effects screening levels, and therefore adverse health effects are not expected. The TCEQ is the agency responsible for the review of the State Health Effects analysis, and on December 17, 2018, the TCEQ issued an order granting air quality permits to RG LNG. Further, potential pollution emissions from the LNG Terminal site, when considered with background concentrations, would be below the NAAQS, which are designated to protect public health including sensitive populations such as children, the elderly, and asthmatics. As described in section 4.12.1.6 of the EIS, RG LNG would need to prepare an emergency response plan that would include provisions for evacuation of the public, including cost sharing plans and coordination with appropriate state and local agencies. If authorized, the emergency response plan and cost sharing plan would need to be submitted for review and approval prior to any construction at the site.

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and public services. As discussed above, Port Isabel and Laguna Madre have no hospitals.⁴⁵ Therefore, the communities closest to the Project would likely rely on the medical facilities in neighboring Brownsville. In the event of a disaster requiring evacuation or causing trauma and hospitalization, Port Isabel residents would be required to travel to one of Brownsville's two medical centers with trauma centers.⁴⁶ While the DEIS acknowledges these risks and requires the Rio Grande to establish procedures, there is no analysis on whether the hospitals can handle such a disaster. Further, in the event of a disaster requiring evacuation, there is no analysis on routes residents closest to the Project will be able to take to reach safety or medical services. The most direct route to Brownsville and its medical services passes directly adjacent to the proposed facility.

CO9-11

Lastly, the DEIS fails to consider the difficulties the construction Projects place on public services to handle an emergency, such as an on-site fire. While Rio Grande LNG plans to train their employees as emergency responders by teaching them how to provide first aid and on-site security,⁴⁷ there are no details regarding how the Project will handle a large-scale disaster. In the event that an on-site fire or a similar disaster breaks out either on the construction site or after the construction phases are complete, Port Isabel would be the primary responder to any fires at the proposed Terminal site.⁴⁸ Port Isabel's Fire Department, however, has only two full-time firefighters, and with the significant lack of potential tax dollars resulting from the abatement, Port Isabel might lack the capacity to expand its services. The DEIS fails to provide adequate analysis of the strain the Project—involving volatile materials and heavy construction—would put on public safety services.

CO9-12

CO9-12

As described in section 4.12.1.6 of the EIS, RG LNG would need to prepare an emergency response plan and a cost sharing plan. If the project is authorized, both plans would need to be submitted for review and approval prior to construction of the project. The cost sharing plan would specify direct cost reimbursements to any state and local agencies and would include capital costs for equipment and for any required specialized training.

⁴⁵ Rio Grande LNG Project Rio Bravo Pipeline Project, Resource Report 5: Socioeconomics, RR 5-102.

⁴⁶ *Id.*

⁴⁷ *Id.*

⁴⁸ *Id.* at 5-103.

4. The DEIS Fails to Adequately Consider Impacts to Nearby Residential Property Values

The DEIS failed to adequately consider impacts to property values. The DEIS states only that “the nearest residences [to the LNG Terminal] are about 2.2 miles away in Port Isabel.”⁴⁹ So, while it “would be possible to see the LNG Terminal from some vantage points in Port Isabel and Laguna Heights,” the DEIS believes “its visibility ... would not be a prominent feature in the viewshed for these residences.”⁵⁰

Other than citing studies showing that “adverse impacts on property values decreased steadily with distance from the industrial development,”⁵¹ the DEIS does not provide any further analysis on the impact the Project will have on neighboring communities. Truthfully, since the LNG market is young, economic studies on the effects of large-scale, industrial LNG projects on nearby property values are scant. However, comparable studies have been conducted for decades regarding the effects of other high-polluting industrial projects on nearby property values. For example, a University of California - Berkeley study found that home values within two miles of power plants opened up in the U.S. in the 1990s decreased by three to seven percent by the mid-2000s.⁵² In addition, power plant openings are correlated with significant decreases in mean household incomes in areas near the plants, and the proportion of homes that are owner-occupied decreased by two to five percentage points as well.⁵³ While the homes nearest to the Rio Grande LNG Project are approximately 2.2 miles away in the Port Isabel area, the power plants analyzed in the UC Berkeley paper were also in areas with low population density like the proposed site in question, making it likely that a slight increase in distance from the LNG terminal will not make

⁴⁹ DEIS, 4-223.

⁵⁰ *Id.*

⁵¹ *Id.*

⁵² Lucas W. Davis, *The Effect of Power Plants on local Housing Values and Rents*, *The Review of Economics and Statistics* 93: 4, 1391–1402, 1392, attached as Exhibit 17, available at <http://realneo.us/system/files/PowerplantValueImpact.pdf>.

⁵³ *Id.*

CO9-13

We disagree. Impacts on property values are addressed in section 4.9.9; we recognize that housing markets are sensitive to real or perceived hazard risks from industrial development.

CO9-13

much of a dent in potential decreases in property values. In sum, the DEIS's lack of in-depth analysis of property values demonstrates a failure to adequately consider socioeconomic impacts.

CO9-13

5. The DEIS Fails to Adequately Consider Impacts to Vehicular Traffic in its Vicinity

During construction, there will be a large increase in vehicular traffic, particularly on SH-48. The DEIS acknowledges that traffic will increase on SH-48 during construction. About 17,000 vehicles per day travel on SH-48 during peak season, and construction will add 4,600 round trips.⁵⁴ Thus, the DEIS expects that use of SH-48 would result in "a substantial increase in daily vehicle trips."⁵⁵

The DEIS relies on a Traffic Impact Analysis that states that the "greatest concern is the up to 4,600 vehicles that exit the Project site at the end of the construction workday."⁵⁶ The analysis shows that even with mitigation, the traffic flows will be negatively impacted with a significant increase in delays during morning and evening peak travel times.⁵⁷ For example, the intersection of SH-48 with SH-100, closest to the Port Isabel, delays will increase from 12.7 pre-construction to 27.4 peak construction.⁵⁸ For the intersection of SH-48 and SH-550, the main intersection connecting Brownsville to Port Isabel, the morning traffic volume will increase from 922 vehicles to 4,680 during peak construction.⁵⁹

CO9-14

The DEIS fails to consider the effect that this increased traffic and resulting change in traffic patterns will have on the low-income minority communities closest to the Project. This large increase in traffic will impact the ability of residents to reach their workplaces or medical services in Brownsville in a timely manner. The visitation patterns of tourists may also change

⁵⁴ See DEIS, 4-218 – 4-219.

⁵⁵ DEIS, ES-16.

⁵⁶ Traffic Impact Analysis: Rio Grande LNG Project, 32.

⁵⁷ Traffic Impact Analysis: Rio Grande LNG Project, 26.

⁵⁸ Traffic Impact Analysis, Tables 4 and 7, pp. 17 and 26.

⁵⁹ Traffic Impact Analysis, Table 2, p. 10.

CO9-14

Impacts on minority and low-income populations, including impacts associated with traffic delays, are addressed in section 4.9.10. RG LNG has committed to fund roadway improvements to SH-48 and SH-100 as described in section 4.9.8.1. With these improvements and RG LNG's commitment to bus workers to the LNG Terminal site during peak construction, SH-48 would continue to provide ample capacity, even during the peak tourism season.

based on this increased in traffic, and yet the DEIS fails to anticipate how the pattern might change and how such changes might impact businesses and residents in Port Isabel and Laguna Heights.

CO9-14

C. The DEIS Fails to Adequately Consider the Socioeconomic Impacts of the Rio Grande LNG Project

1. Claims that the Project Will Increase Jobs and Create Positive In-flows into the Local Economy Fail to Fully Account for the Shocks to the Economy Created by the Construction Phases of the Project

Construction of the LNG Terminal would require an average monthly construction workforce of 2,950 workers (peak of 5,225 workers) over a construction period of seven years. It is estimated that construction workers would be on site throughout the duration of the construction period, with an average monthly construction workforce of 2,950 workers, and a high of approximately 5,225 workers during a 17 month period spanning years four and five.⁶⁰ Approximately 30% of the workers would be hired locally, per Rio Grande LNG's numbers, meaning that anywhere from 2,065 to 3,658 workers could be non-local.⁶¹ Rio Grande LNG estimates that out of the non-local workers during the construction period, about 70% would be accompanied by family members.⁶² Out of the estimated \$22.4 billion in direct expenditures that will arise during the construction phase of the terminal and pipelines, about \$4 billion will be spent on materials, a "portion of which" may be regionally or locally sourced.⁶³ Rio Grande LNG also estimates that both local and non-local workers both directly employed for the terminal and pipeline projects as well as workers providing services (e.g., transportation contracts for materials) will spend approximately 2.7 billion in payroll on housing, food, gas, and other goods,

⁶⁰ DEIS, 4-198-199.

⁶¹ ID.

⁶² ID.

⁶³ DEIS 4-204, 205.

CO (Companies and Organizations)

CO9 - Sierra Club

services and entertainment in the area.⁶⁴

The logic of the DEIS is shortsighted. Increased employment and expenditures are often the source of an influx of consumer activity of economy. As demands for goods and services and the spending of disposable income by workers at local businesses increases, economic advantages should, in theory, trickle down. Surely, it is possible, if not likely, that the local economy of the areas surrounding the projects will react positively, resulting in a temporary stimulus to the existing housing industry, and existing retail, educational, and healthcare services in the area, at least during the construction period.

However, the rollercoaster effect created by two separate shocks to the local economy – the introduction of the construction project and the completion of the project – may produce serious complications. First, it is unclear how much of the \$4 billion towards construction materials will be “regionally or locally sourced,” and only 30% of workers will be hired locally. With a large influx of temporary employees, any per capita growth in gross domestic product is diluted, and thus there is not as much of a boon to the local economy as the gross numbers make it seem. In this sense, economic activity that arises to meet the demand of the remaining 70% of employees hired from out-of-state for the project may not significantly increase the area’s per capita income or standards of living. Second, an influx of 70% foreign workers should make a serious impact in the kinds of entrepreneurial activity that develops to accommodate growing demand for, say, housing and retail. These non-local workers bring with them different cultures and lifestyles, which will likely be reflected in the markets that emerge to accommodate their presence, and thus may significantly change the character of the area.

These problems are magnified when considering the Rio Grande LNG developer’s estimated tally for its final, permanent workforce. Unfortunately, the Rio Grande LNG developers

⁶⁴ *Id.*

CO9-15

CO9-15

As addressed further in section 4.9.2, RG LNG and RB Pipeline estimate that about \$3.2 billion and \$60 million, respectively, in expenditures for materials would be sourced locally or regionally. In terms of housing to accommodate the influx of workers, in section 4.9.6, we find that the existing housing inventory would be sufficient to accommodate these workers and their families. We recognize that construction of the Project would provide a boost in the area economy that would not be sustained during operation; however, the peak construction workforce would result in a less than 1 percent change in the area population, and it is unlikely that these individuals would have a meaningful impact on the types of goods and services provided in the Project area.

With regard to the referenced 2018 study, the link provided is to an article that is reporting on data released by the federal Bureau of Economic Analysis, which shows that while Edin’s Gross Domestic Product (GDP) dropped in 2018 and northern Oklahoma’s economy slowed in the previous years, job creation continued, which boosted local and state economies. Further, the article states the overall area economy is strong and unemployment is low.

estimate a need for only about 290 permanent jobs for both the Terminal and the Pipeline once the construction phases are complete. Since LNG exportation is not a local feeder industry, any entrepreneurial activity that develops to absorb the disposable income of employees in the area will suddenly face a lack of demand, causing local markets, e.g., retail and entertainment markets that thrive on disposable income, to shrink. Furthermore, local contractors relying on the project, e.g., assisting with secondary manufacturing needs, transportation, and possibly even utilities, could all be impacted by a disproportionately large shock to a local economy that lacks the diversity of a large, metropolitan urban economy. This could result in displacement and increased unemployment, to start with. There is some evidence of similar effects from other regions of the country. As large energy construction projects come to an end, the regional gross domestic product of less urban, less economically diverse areas may decrease significantly. For example, in a 2018 study released by the federal Bureau of Economic Analysis, Enid, Oklahoma's GDP dropped 7.8% after large energy-related construction projects came to an end – the largest decline in gross domestic product in 2017 among the country's 383 metropolitan areas.⁶⁵

CO9-15

2. The Estimated Annual Economic Impact of the Projects Fails to Account for the Adverse Impacts of High-Paid, Skilled Workers on Low-Income Areas, Social Costs Incurred by Neighboring Communities, and Market Volatility

Anticipated operational direct expenditures for the LNG Terminal would be \$1.9 billion annually, and RG Developers anticipate that a 270 person operational staff for the LNG Terminal would result in an annual payroll of \$24.3 million. Anticipated operational direct expenditures for the Pipeline System would be \$179.7 million annually, and about \$1.3 million in annual payroll for 20 permanent operational staff members. They estimate that the RNG Terminal project will

CO9-16

⁶⁵ Adam Wilmoth, "Enid's economy slows as construction projects are completed, NewsOK (Sept. 20, 2018), attached as Exhibit 18, available at <https://newsok.com/article/5608887/enids-economy-slows-as-construction-projects-are-complete>.

CO9-16

The operation workforce represents 0.021 percent of the population of the three-county area (i.e., Cameron, Hidalgo, Willacy); as such it is not likely that the spending habits of this nominal group would have a meaningful impact on area markets.

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result in a \$1.4 billion economic impact for Cameron County.

However, there are three inconsistencies here. First, \$24.9 million in annual payroll among 270 permanent Terminal employees amounts to nearly \$89,000 in average annual salary. While 270 employees would make a relatively small dent if diluted within the workforce of a large metropolitan area, with relatively few residential areas in the vicinity of the Terminal, these salaries could significantly influence local consumer preferences. For instance, such high salaries in a county with an average salary of under \$15,000 could pressure small businesses to either cater to more moneyed patrons, or succumb to competition from businesses that are more willing to operate in the lifestyle markets that interest the new local consumer base. Furthermore, for existing businesses, rents can increase because of increased residential and consumer demand in an area. If a business's revenue does not increase, then operating costs could become unsustainable and force businesses to shutter their doors. And of course, if LNG Terminal employees remain concentrated in a given area, e.g., Port Isabel or Laguna Heights, then residential property prices could rise in the given area in response to the demand from a wealthier population. This increases the probability of displacement due to either the increased property taxes after the area is re-appraised, or increased rents.

CO9-16

Next, the projects impose social costs on current area-residents as well. These future, richer LNG employees – especially if they're from out-of-town or out-of-state – could further any changes in the character of communities that began during the influx of foreign workers brought about by the construction phases of the project. This contributes to the disintegration of community cohesiveness and identity. This could have the effect of reducing civic engagement

CO9-17

CO9-17

The anticipated portions of the construction and operational workforces that would be non-local represents less than 1 percent of the area population, therefore it is not likely that the spending habits of this nominal group would have a meaningful impact on community character. In addition to the public outreach described in sections 1.3 and 4.9.10 of the EIS, RG Developers have been coordinating additional outreach focused on job opportunities for local workers (see section 4.9.2) and have committed to donations that will fund community projects (see section 4.9.5). We conclude that the Project, as modified by our recommendations in section 4 of the EIS, would not destroy community values, rural quality of life, or sense of place.

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and increasing mental health issues among residents facing displacement.⁶⁶

CO9-17

Lastly, and more broadly, the LNG market is young and volatile, meaning that the estimated economic impact to the region (and the country) needs to be analyzed more profoundly. First, some industry sources forecast a supply gap, with forecasted demand exceeding supply. These industry sources are often concerned with filling the supply gap by increasing U.S. production.⁶⁷ Second, other industry sources are concerned with the seasonality of the LNG market.⁶⁸ Historically, total demand for LNG varies seasonally, while supply is usually flat. This imposes high costs of storage on LNG exporters, which in turn causes volatility. This means LNG prices change in accordance with this temporal mismatch. Note, however, if the U.S. becomes the largest LNG seller by 2025, as some industry sources predict, then it is unclear how the increased competition in LNG exporting will affect Rio Grande LNG's projected economic impact.⁶⁹ Third, another factor that can impact LNG prices in the U.S. is the projected increase in price of gas for consumers as more natural gas is exported. While consumers can react to the price impact of LNG exports as long as LNG exports can be anticipated, it is extremely difficult to predict the amount of exports that can be shipped out of any given terminal, since there is considerable debate among engineers regarding how much can be produced out of each shale gas basin.⁷⁰ In other words, the

CO9-18

CO9-18

This comment is outside the scope of the EIS. Economic need for the Rio Bravo Pipeline will be discussed in the Commission Order to the extent relevant but for the most part the export of the commodity is part of the proceedings at DOE for applications to export natural gas.

⁶⁶ Zukin, Sharon, Valerie Trujillo, Peter Frase, Danielle Jackson, Tim Recuber, and Abraham Walker, *New Retail Capital and Neighborhood Change: Boutiques and Gentrification in New York City*, City and Community 8:1, 47-64, attached as Exhibit 19.

⁶⁷ Stacey Morris, "U.S. LNG Exports Part 1: Capacity Jumping in 2019, But Will There Be Enough?" SeekingAlpha.com (Jul. 11, 2018), attached as Exhibit 20, available at <https://seekingalpha.com/article/4186550-u-s-lng-exports-part-1-capacity-jumping-2019-will-enough?page=2>.

⁶⁸ Shell LNG Outlook 2018, p. 24, attached as Exhibit 21, available at https://www.shell.com/energy-and-innovation/natural-gas/liquefied-natural-gas-lng/lng-outlook/_jcr_content/par/textimage_864093748.stream/1519645795451/d44f97c4d4c4b8542875204a19c0b21297786b22a900ef8c644d07d74a2f6cae/shell-lng-outlook-2018-presentation-slides.pdf. Sylvie Cornot-Gandolphe, *New and Emerging LNG Markets: The Demand Shock* (June 2018), p. 40, attached as Exhibit 22, available at https://www.ifri.org/sites/default/files/atoms/files/cornotgandolphe_new_emerging_lng_markets_2018.pdf.

⁶⁹ Jude Clemente, *Qatar As Major Competition For U.S. Liquefied Natural Gas*, *Forbes* (Nov. 11, 2018), attached as Exhibit 23, available at <https://www.forbes.com/sites/judeclemente/2018/11/07/qatar-as-major-competition-for-u-s-liquefied-natural-gas/#51824b3678ae>.

⁷⁰ The Deloitte Center for Energy Solutions, *Made In America: The economic impact of LNG exports from the United*

economic impact projected by the DEIS should take the market volatility of LNG into account if it hopes to be accurate.

CO9-18

D. The DEIS Does Not Adequately Consider How the Environmental Degradation Caused by the Projects Will Likely Adversely Impact Local Industries

1. The DEIS Does Not Adequately Consider Adverse Impacts to Tourism

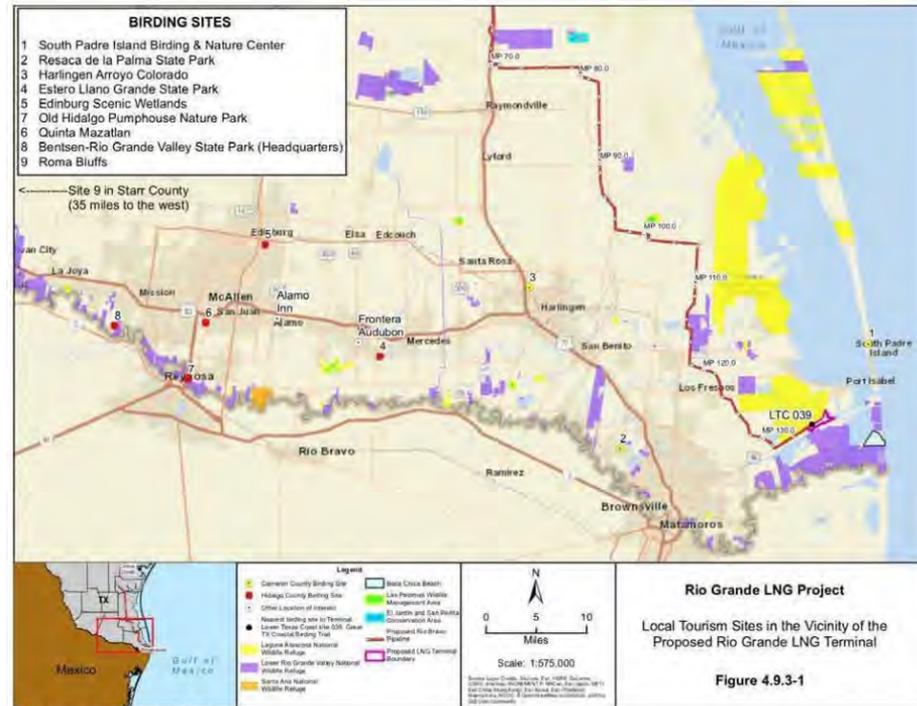
a) Industry Overview

The Rio Grande LNG project, along with two other major LNG export terminals, will increase air pollution, large vessel traffic, and noise to an area where tourism—especially nature-oriented tourism like bird watching and fishing—is a major source of employment and income. Many low-income residents are employed in jobs related to the hospitality industry serving the areas tourists. Adverse impacts of the area's ability to draw nature-oriented tourists would significantly affect this population.

States, Deloitte Insights (Jan. 25, 2013), attached as Exhibit 24, available at <https://www2.deloitte.com/insights/us/en/industry/oil-and-gas/made-in-america-the-economic-impact-of-lng-exports-from-the-united-states.html>.

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DEIS, Figure 4.9.3-1.

The Rio Grande Valley is one of the top bird watching destinations in the country.⁷¹ “Texas is the number one birdwatching state/province in North America, and the Texas Rio Grande Valley is often considered the number two birdwatching destination in North America. The four counties of the Valley—Hidalgo, Starr, Willacy, and Cameron—together have recorded almost 500 bird species—more than all but four states.”⁷² Ecotourism brought \$25.4 billion to the state, based on estimates from the Texas Comptroller’s office.⁷³ Ecotourism in the Rio Grande Valley brings in “between \$100 million and \$170 million annually and employs *several thousand*

⁷¹ See DEIS, Figure 4.9.3-1 reproduced above.

⁷² Mathis & Matisoff, Houston Advanced Research Center, *A Characterization of Ecotourism in the Texas Lower Rio Grande Valley* (March 2004), p. 1, attached as Exhibit 25.

⁷³ *Id.* at 14.

CO (Companies and Organizations)

CO9 - Sierra Club

people.⁷⁴ The proposed terminal site is sandwiched between two National Wildlife Refuges that are less than 0.25 miles from the project site.⁷⁵



Designated Birding Sites Part of the Great Texas Birding Trail (Source: Texas Parks and Wildlife)⁷⁶

There are many designated birding sites near the terminal site, including the South Padre Island Birding & Nature Center and locations on the Great Texas Birding Trail.⁷⁷ In addition to the designated spots, there are innumerable unofficial birding sites within the parks and nature reserves. Part of what makes the area a unique birding site and major tourist attraction is its position within the Central Flyway. A major migratory route, over 380 species travel along the

⁷⁴ *Id.* at 17. (emphasis added).

⁷⁵ See DEIS, 4-70.

⁷⁶ Attached as Exhibit 26, available at <https://tpwd.texas.gov/huntwild/wildlife/wildlife-trails/lc>.

⁷⁷ See DEIS, 4-206.

Central Flyway.⁷⁸ The area surrounding the proposed terminal project is where birds make first landfall after crossing the Gulf of Mexico.⁷⁹ The Laguna Atascosa National Wildlife Refuge, immediately adjacent to the proposed terminal site, was established in 1929 to serve as a sanctuary for migratory birds.⁸⁰ Habitat destruction, like the construction of a major pipeline and LNG terminal, is a rising threat to migratory birds.⁸¹

In addition, South Padre Island draws \$370 million each year to Cameron County and “approximately \$266 million to Brownsville, Port Isabel/Laguna Vista, and Los Fresnos.”⁸² For Port Isabel and Laguna Vista, nearly 36% of their employment is related to economic activity on South Padre Island.⁸³ Recreational fishing in the Lower Laguna Madre System contributed an estimated 479 jobs and \$45.3 million in the sales of goods and services.⁸⁴

b) The DEIS Inadequately Considers the Adverse Impacts to the Tourism Industry

The DEIS acknowledges a number of impacts of the LNG Terminal on the tourism industry. First, the DEIS admits that noise and visual impacts will affect some birdwatching sites, but claims the impact will be minimal and unlikely to affect the birdwatching tourism industry in Cameron County.⁸⁵ Also, the DEIS concedes that tourists may expect traffic delays on SH-48,

⁷⁸ “Central Americas Flyway: Fact Sheet,” Bird Life International, attached as Exhibit 27, available at http://datazone.birdlife.org/userfiles/file/sowb/flyways/2_Central_Americas_Factsheet.pdf.

⁷⁹ Tim Harris, “RSPB Migration Hotspots: The World’s Best Bird Migration Sites,” 2013, p. 48, attached as Exhibit 28.

⁸⁰ *Id.*

⁸¹ Paul A. Johnsgard, “Wings Over the Great Plains: Bird Migrations in the Central Flyway,” (2012), p. 21, attached as Exhibit 29.

⁸² South Padre Island Economic Development Corporation, “Economic Impact of South Padre Island,” p. 3, attached as Exhibit 30, available at <http://southpadreislandedc.com/sites/default/files/files/Resources%20%26%20Studies/SPI%20Economic%20Impact%20Analysis%20Summary.pdf>.

⁸³ *Id.* at 2.

⁸⁴ Andrew Ropicki et al., “The Economic Impacts of Recreational Fishing in the Lower Laguna Madre Bay System,” Nov. 9, 2016, p. 2, attached as Exhibit 31, available at http://texasseagrants.org/assets/uploads/resources/16-512_The_Economic_Impacts_of_Recreational_Fishing_in_the_Lower_Laguna_Madre_Bay_System.pdf.

⁸⁵ DEIS, 4-206 – 4-208.

CO (Companies and Organizations)

CO9 - Sierra Club

altering “visitation patterns” as tourists go to more “scenic sights away from the LNG terminal.”⁸⁶

Lastly, nature tourism at the Bahia Grande would be exposed to noise during construction and during operations, with the terminal operating “24 hours a day, 7 days a week.”⁸⁷

The DEIS does not provide any evaluation of how noise and visual impacts will impact tourism. It acknowledges that the project may alter “visitation patterns,” but does not address what these visitation patterns might look like. Not to mention, this treatment fails to account for the motivations behind nature tourism, which is steeped in admiration for nature that is or perceived to be undisturbed. *Without any evidentiary support*, the DEIS posits that the project will not affect the gross number of tourists that visit the area.

This seems counterintuitive, and any degree of imprecision in the DEIS is problematic because even a relatively minor impact to the tourism industry can result in huge repercussions for the region. A 2011 Texas A&M University study on nature tourism in the Rio Grande Valley documented a \$344 million dollar economic benefit.⁸⁸ Further, based on data from the Bureau of Labor Statistics, there are 671 tourism businesses and 12,296 tourism jobs in Cameron County.⁸⁹ And due to its pristine beaches and clean water, South Padre Island draws about a million overnight visitors yearly, adding an estimated \$370 million to the Valley’s economy in 2011 alone.⁹⁰ Thus, even a small dent in economic impact could result in tens of millions of dollars of lost revenues for the region, which is especially harmful in the case of South Padre Island, where

⁸⁶ *Id.* at 4-208.

⁸⁷ DEIS, 4-209.

⁸⁸ Kyle M. Woosman, Rebekka M. Dudensing, Dan Hanselka, Seonhee An, “An Initial Examination of the Economic Impact of Nature Tourism on the Rio Grande Valley,” Texas A&M Univ. 1 Sept 2011, attached as Exhibit 32.

⁸⁹ See Shawn Stokes and Marcy Lowe, “Wildlife Tourism and the Gulf Coast Economy,” Jul. 9, 2013, p. 8, attached as Exhibit 33, available at https://www.mmc.gov/wp-content/uploads/Stokes-and-Lowe-2013-Wildlife-Tourism-and-the-Gulf-Report_FINAL.pdf.

⁹⁰ “Economic Impact of South Padre Island,” South Padre Island Economic Development Corporation, 2012, attached as Exhibit 30, available at <http://southpadreislanddc.com/sites/default/files/files/Resources%20%26%20Studies/SPI%20Economic%20Impact%20Analysis%20Summary.pdf>.

CO9-19

The EIS recognizes the Project’s impacts on tourism in section 4.9.3 including an increase in noise, changes in the visual landscape, and heavier traffic along SH-48. Recreation and special use areas, including birding trails, that are in proximity to the Project are also addressed in section 4.8.1.5, while impacts on visual receptors at recreation and special use areas are addressed in section 4.8.2. We find that impacts on tourism, including nature-based and eco-tourism, would generally be greatest during construction of the Project. Following construction, the LNG Terminal would be the primary source of permanent impacts on tourism, as the pipelines would be buried and the associated aboveground facilities would be in remote areas, offering limited visibility and mitigating noise impacts. To mitigate impacts on visual receptors and operational noise from the LNG Terminal, RG LNG would use ground flares, grey tank coloring, horticultural plantings, and the construction of a levee that would obstruct most construction activities and low-to-ground operational facilities from view. Further, as indicated in sections 4.5 and 4.6, overall impacts on general vegetation, wildlife, and birds from the Project would not be significant. In conclusion, as impacts on the general populations of birds and wildlife have been mitigated in consideration of our recommendations, and with our finding that visitation patterns may change but overall, but the number of visits to the Project area would likely not, we find that employment in the tourism industry is not likely to be significantly affected. We have revised section 4.9.3, accordingly.

CO9-19

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tourism is by far the dominant industry. In addition, a decrease in economic impact from the tourism industry can translate to an uptick in unemployment. Even if the number of jobs created by the LNG projects would be enough to supplant the loss of tourism industry jobs, much of the jobs created by the projects will be staffed by out-of-towners and/or by workers with specific skills. This could exclude workers that may have lost their jobs as a result of any damage to the tourism industry. These workers may also reside in low income areas, such as Laguna Heights, which in turn magnifies the impact of the project on low income, minority communities. Lastly, tourism workers may not have the skills to staff the influx of incoming, construction-related jobs.

CO9-19

A further risk is whether the presence of three major LNG export terminals and other industrial projects will discourage future investment in the area that would be consistent with the tourism industry or, conversely, attract more high polluting projects. Quality of life and recreational activities are important factors that companies consider when choosing where to invest in office operations.⁹¹ The project area has a natural, comparative advantage to other communities because of its low cost of living, many recreational opportunities, and unique natural beauty. The project area will lose that comparative advantage if it instead caters to high polluting industries that degrade the very things that make it an attractive place to live.

CO9-20

A study from the University of Indiana shows that high concentrations of certain industries tend to attract investment in the same industries.⁹² Industries tend to cluster to take advantages of benefits of proximity to related industries and infrastructure.⁹³ The DEIS fails to consider that this project and others will attract similar investments in other high polluting

⁹¹ See Parks and Recreation's Role in Economic Development," The George Mason University Center for Regional Analysis, May 2018, attached as Exhibit 34, available at <https://www.nrpa.org/siteassets/nrpa-economic-development-report.pdf>.

⁹² Timothy Slaper and Ping Zheng, "Why Invest There?," Center for International Business Education and Research, Sept. 2018, attached as Exhibit 35, available at <http://www.ibrc.indiana.edu/studies/why-invest-there-2018.pdf>.

⁹³ *Id.*

CO9-20

Reasonably foreseeable projects that might cause cumulative impacts in combination with the proposed Project are addressed in section 4.13. Impacts on recreation and special use areas and visual resources are addressed in sections 4.8.1.5 and 4.8.2, respectively. We do not speculate on if or when additional projects would be constructed along the BSC that are not reasonably foreseeable as described in section 4.13.1; however, we note that the mission statement of the Port of Brownsville/BND, which owns and leases the lands along the BSC, is "to increase growth development, and establish the port as a world class port."

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projects to the detriment of the local population.

CO9-20

2. The DEIS Fails to Adequately Analyze the Project’s Impact on the Recreational Fishing Industry

The DEIS separately acknowledges that the LNG Terminal will have adverse impacts on recreational fishing. Fishing along the eastern bank of the Bahia Grande Channel on the LNG Terminal site would be prohibited.⁹⁴ In addition, construction noise will “likely be audible at local fishing sites” and dredging during construction “may take place 24 hours per day, 7 days per week.”⁹⁵ During operation, LNG carriers “would call on the LNG terminal” about 6 times per week, and this could cause fishing boats to be delayed, with a “maximum estimated delay for fishing vessels in the BSC” to be 3 hours.⁹⁶ The DEIS then concludes, without providing supporting evidence, that recreational fishing is unlikely to “be significantly modified,” although “visitation patterns immediately adjacent to the LNG Terminal site may change.”⁹⁷

CO9-21

This treatment leaves much to be desired. First, the DEIS fails to provide in-depth consideration of the cumulative impacts the multiple projects will have on recreational fishing. For example, there is no analysis on the cumulative impact of the LNG carriers servicing the LNG Terminals will have on traffic in the BSC. The cumulative impact is downplayed as “temporary,” “short-term,” and “minor” due to the presence of other recreational opportunities nearby.⁹⁸ While the LNG carriers servicing the Rio Grande terminal may just be 312 a year, the total number of LNG Carriers for all three proposed LNG terminals is 512.⁹⁹ This impact will not be “temporary” or “short-term,” since it will continue so long as the terminals are operating. And yet other than underscoring the area’s other recreational fishing opportunities, the DEIS does not provide any

CO9-22

⁹⁴ See DEIS, 4-210.
⁹⁵ *Id.*
⁹⁶ *Id.*
⁹⁷ *Id.* at 4-211.
⁹⁸ See DEIS, 4-426.
⁹⁹ See DEIS, 4-401.

CO9-21

Support for our conclusion can be found in section 4.9.3.2. Specifically, less than 1 percent of recreational boat fishing is within Brazos Santiago Pass and the BSC, and only a small number of anglers and fishing guides fish for snook specifically within the BSC.

CO9-22

Cumulative impacts on marine transportation, including within the BSC, are addressed in section 4.13.2.7. The commentors reference to our finding that impacts on recreation would be temporary, short-term, and minor are associated with the construction of the proposed Project and other projects within the applicable geographic scope established for recreation and special interest areas. As further addressed in section 4.13.2.6, the long-term or permanent cumulative impacts on recreation and special interest areas would be associated with vegetation clearing and maintenance of the pipeline right-of-way, and the changes in the viewshed for recreationalists from the presence of aboveground components. Cumulative impacts on visual resources are addressed within this section, while cumulative impacts on vegetation and wildlife are addressed 4.13.2.3. Finally, the discussion for cumulative impacts on recreation and special use areas in section 4.13.2.6 has been revised to more explicitly capture cumulative impacts during operation of the Project.

analysis supporting their finding that there will be no significant impact on recreational fishing.

CO9-22

By failing to acknowledge the interdependent nature of recreational fishing and the tourism industry, the DEIS fails to adequately address the impact the project will have on the tourism industry. The Brownsville Economic Development Council describes recreational fishing as “a major attraction for locals and tourists.”¹⁰⁰ Recreational fishing is a significant portion of wildlife tourism in Texas, accounting for 29% of wildlife tourists.¹⁰¹ In 2011, 7,769,000 people participated in wildlife activities in Texas, and 2,253,010 of those people participated in recreational fishing.¹⁰² Recreational fishing in the Lower Laguna Madre System alone contributed an estimated 479 jobs and \$45.3 million in the sales of goods and services.¹⁰³

CO9-23

By failing to consider the adverse impacts recreational fishing will have on the tourism industry, the DEIS fails to adequately consider the adverse impact the project will have on the local economy. This lack of nuance dilutes the impact on both tourism and recreational fishing by failing to consider simultaneous adverse effects the project may have on both industries, thus minimizing the impact of the project generally.

3. The DEIS Does Not Adequately Consider the Adverse Impacts to the Commercial Fishing and Shrimping Industries, Including Impacts to Aquatic Species and Essential Fish Habitat, and Does Not Propose Meaningful Mitigation for These Impacts

a) Industry Overview

The DEIS fails to adequately consider impacts to area residents who shrimp and

¹⁰⁰ See Brownsville Economic Development Council website, attached as Exhibit 36, available at <http://www.bedc.com/sports-recreation>.

¹⁰¹ See Shawn Stokes and Marcy Lowe, “Wildlife Tourism and the Gulf Coast Economy,” Jul. 9, 2013, p. 8, attached as Exhibit 33, available at https://www.mmc.gov/wp-content/uploads/Stokes-and-Lowe-2013-Wildlife-Tourism-and-the-Gulf-Report_FINAL.pdf.

¹⁰² See *id.*

¹⁰³ Andrew Ropicki et al., “The Economic Impacts of Recreational Fishing in the Lower Laguna Madre Bay System,” Nov. 9, 2016, p. 2, attached as Exhibit 31, available at http://texasseagrant.org/assets/uploads/resources/16-512_The_Economic_Impacts_of_Recreational_Fishing_in_the_Lower_Laguna_Madre_Bay_System.pdf.

CO9-23

We disagree and assert that the EIS recognizes the interdependency between tourism and recreational fishing. As addressed further in section 4.9.3, recreational fishing is recognized as a major tourist draw in the Rio Grande Valley. We report that 23.6 percent of tourist trips include participation in a variety of activities, including recreational fishing.

fish for their livelihood and to others who rely on the local fishing and shrimping industry for their livings. It also fails to include adequate mitigation for the harms to this vitally important industry. Between 2009 and 2014, Cameron County accounted for 31% of the Texas shrimp harvest.¹⁰⁴ Including processing facilities, the shrimping industry has a \$145 million impact per year on Cameron County.¹⁰⁵ With 178 shrimping vessels, shrimping is a significant part of the local economy.¹⁰⁶ Currently, there are 106 permits for Gulf Royal Red Shrimp issued to Texas shrimpers. Thirty-five of those permits were issued to people in Port Isabel, and 45 of those permits were issued to people in Brownsville.¹⁰⁷ There are 542 permits for Gulf of Mexico Shrimp issued to Texas shrimpers. Seventy-one of those permits were issued to people in Port Isabel, and 84 of those permits were issued to people in Brownsville.¹⁰⁸

The Rio Grande LNG terminal would be located between the Bay and the Brownsville Fishing Harbor, where approximately numerous shrimping trawlers and fishing boats are docked. As the DEIS acknowledges, the Port of Brownsville “is the primary marina for Gulf shrimping vessels that operate out of Cameron County”¹⁰⁹ and “the Port of Brownsville and the Port Isabel together ranked as the second largest commercial fishing port by value along the Gulf of Mexico.”¹¹⁰

¹⁰⁴ See Andrew Ropicki et al., “Economic Impacts of the Cameron County Shrimp Industry,” Jun. 2016, attached as Exhibit 37, available at <http://cameron.agrilife.org/files/2015/06/Cameron-County-Shrimp-Industry-Economic-Impacts.pdf>.

¹⁰⁵ See *id.*; see also Rod Santa Ana, “Experts: Shrimp imports depress market prices and pose health risks,” AgriLife Today, Aug. 27, 2015, attached as Exhibit 38, available at <https://today.agrilife.org/2015/08/27/shrimp-imports-depress-market-prices/>.

¹⁰⁶ Tony Reisinger and Andrew Ropicki, Ph.D., 2016 *Cameron County Shrimp Industry Best Management Practices Outreach*, “Extension Education in Cameron County: Making a Difference,” (2016), p. 40, attached as Exhibit 39, available at <http://counties.agrilife.org/cameron/files/2011/04/2016-Making-a-Difference-Cameron-County.pdf>.

¹⁰⁷ National Oceanic and Atmospheric Administration, Gulf Royal Red Shrimp Permit Records, attached as Exhibit 40, available at <https://portal.southeast.fisheries.noaa.gov/reports/foia/GRRS.htm> (accessed Nov. 20, 2018).

¹⁰⁸ National Oceanic and Atmospheric Administration, Gulf of Mexico Shrimp Permit Records, attached as Exhibit 41, available at <https://portal.southeast.fisheries.noaa.gov/reports/foia/SPGM.htm> (accessed Nov. 20, 2018).

¹⁰⁹ DEIS, 4-213.

¹¹⁰ DEIS, 4-101.

b) Impacts on Essential Fish Habitat

FERC concludes in the DEIS that the construction of just the RG LNG Terminal alone would result in the permanent loss of 230.1 acres of EFH and that the project would result in permanent, minor impacts on EFH.¹¹¹ The DEIS also concludes “minor impacts” on aquatic resources and the direct mortality of immobile aquatic life during dredging for the LNG Terminal and installation of the Pipeline System.¹¹² Portions of the “BSC, wetlands, waterbodies, and mudflats on the LNG Terminal site, the Bahia Grande Channel, and the water column” at the proposed dredging sites have been designated as essential fish habitat.¹¹³ The DEIS concludes that, although minor, the alteration of aquatic habitats and the mortality or displacement of aquatic life that relies on these essential fish habitats would be permanent.¹¹⁴

However, the DEIS does not provide an opportunity for meaningful review of FERC’s Required EFH Assessment because it is only in its initial stage. FERC only includes an initial EFH Assessment in the DEIS and *the Applicant’s draft EFH Assessment* as the agency’s “initiation of EFH consultation.”¹¹⁵ The next crucial steps in the EFH process – the EFH Conservation Recommendations by NMFS and FERC’s response to those recommendations – have not occurred yet, and thus will not be available during the public comment period for the public to review and provide feedback. For example, FERC states that “NMFS may provide recommendations to FERC regarding further measures that can be taken to conserve EFH. We would respond to any such recommendations.” Thus, the public does not have a meaningful opportunity to review possible future recommendations to conserve EFH.

In this initial step of the EFH consultation in the DEIS, FERC has not adequately

¹¹¹ DEIS 4-121.
¹¹² See DEIS, 5-7 – 5-9.
¹¹³ *Id.*
¹¹⁴ *Id.*
¹¹⁵ DEIS 4-117.

CO9-24

The EIS was prepared in accordance with NEPA, CEQ guidelines, and the Commission’s regulations and policy. The EIS is consistent with FERC style, formatting, and policy regarding NEPA evaluation of alternatives and different impact types. The EIS is comprehensive and thorough in its identification and evaluation of feasible mitigation measures to reduce those effects whenever possible. While some information was still pending at the time of issuance of the draft EIS, the lack of this final information does not deprive the public of a meaningful opportunity to comment on a substantial adverse environmental effect of the Project or a feasible way to mitigate or avoid such effect. The draft EIS included sufficient detail to enable the reader to understand and consider the issues raised by the proposed Project and addresses a reasonable range of alternatives. The final EIS includes additional information provided by RG Developers, cooperating agencies, and new or revised information based on substantive comments on the draft EIS. A revised EFH assessment is provided in appendix M. Consultation regarding the EFH assessment is complete, and, given the temporary, minor impacts on EFH, NMFS does not have EFH conservation recommendations for the Project.

CO9-25

The Port Pelican LNG Project and similar projects were proposed as LNG import terminals that would use seawater to re-gasify LNG; the proposed Project would liquefy LNG onshore and would not use seawater to re-gasify LNG. LNG carriers would release cooling water while docked, and, as discussed in section 4.6.2, we have determined that impacts on aquatic resources from cooling water discharge would be intermittent and minor.

CO9-24

CO9-25

considered or provided mitigation for the demonstrated harmful impacts of other LNG facilities on fisheries. Several National Oceanic and Atmospheric Administration (NOAA) documents demonstrate the high level of concern about the impacts of LNG facilities on fisheries in the Gulf of Mexico, but none of these impacts were considered as part of FERC's DEIS. First, in a 2017 Report from the National Essential Fish Habitat Summit, LNG was identified as one of three "emerging issues" in the Southwest Region:¹¹⁶

"In many Gulf of Mexico LNG facilities, seawater is used to reheat liquid natural gas and is then discharged back into the ocean at about 20°C cooler than the ambient temperature. There was a time lag between the development of LNG facilities and the assessment of the potential effects of the discharge of cooled waters on fish stocks, but studies now show that about five billion fish eggs and larvae are killed per facility due to this cooled discharged water."

In addition, the Gulf of Mexico Fishery Management Council concluded in 2005:¹¹⁷

"Facilities that require substantial intake and discharge of water, especially heated and chemically-treated discharge water, are generally not suited for construction and operation in estuarine and near-shore marine environments. ...

There is also concern over the potential impacts of proposed Liquid Natural Gas (LNG) flowthrough processing facilities in waters of the Gulf of Mexico. These facilities take in large volumes of water to warm LNG. For example, the Port Pelican Liquid Natural Gas (LNG) processing facility is proposed for coastal Louisiana in 25 m (83 ft) of water. During Phase II of its operation, it is projected to take in 176.4 million gallons of seawater per day or 64.4 billion gallons per year. The water will be used to warm the LNG and will undergo a temperature decrease of 11° C (20° F). The intake rate will be around 15 cm/sec (0.5 ft/sec), allowing most larger organisms to avoid impingement at the intake structures, but water passing through the facility will undergo mechanical, pressure,

CO9-25

¹¹⁶ NOAA Technical Memorandum NMFS-OHC-3, August 2017, attached as Exhibit 42, available at <https://spo.nmfs.noaa.gov/sites/default/files/TM-OHC3.pdf>.

¹¹⁷ Gulf of Mexico Fishery Management Council, NOAA, "Generic Amendment Number 3 for Addressing Essential Fish Habitat Requirements, Habitat Areas of Particular Concern, and Adverse Effects of Fishing in the following Fishery Management Plans of the Gulf of Mexico," March 2005, attached as Exhibit 43, available at <https://gulfcouncil.org/wp-content/uploads/March-2005-FINAL3-EFH-Amendment.pdf>

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CO9 - Sierra Club

temperature, and chemical (NaOCl) shock. Some entrained eggs and larvae may survive any one of these adverse conditions (Cada et al. 1981, Muessig et al. 1988), but the combination of these stresses will be lethal to almost all organisms passing through the facility.

There is a special concern regarding the siting of flow-through facilities in or near estuarine passes. Most fishery organisms in the Gulf of Mexico use estuaries as nursery grounds, and eggs and larvae recruit into these areas through tidal passes. Locating facilities in or near these tidal passes will be especially damaging to fishery resources, since eggs and larvae of fishery species are often concentrated in these areas. Locating LNG facilities in shallow water also increases the proportional area of impact. Based on an assessment of LNG facilities, the NOAA Fisheries Southeast Fisheries Science Center recommended that flow-through LNG systems in the Gulf of Mexico should be avoided in favor of closed loop systems. The negative impacts to fishery species and living marine resources in the Gulf from a single flow-through facility could be potentially severe, and cumulative impacts from multiple facilities were considered a threat to fishery resources.”

The only mitigation proposed for impacts to fisheries and EFH is the Applicant’s wetlands mitigation proposal (*see wetlands discussion of these comments*). Additional mitigation should be included to minimize impacts to fisheries from the impacts discussed above.

Another major concern to the region’s fisheries that FERC has not adequately evaluated in the DEIS is the potential for exotic species introductions from ballast water. FERC’s analysis of the potential risks is inadequate because 1) it presumes that because the amount of ballast water is small (0.1%) compared with the entire ship channel without analyzing the potential for exotic species to be introduced from even a small amount of water, and 2) it presumes that Coast Guard and EPA regulations will “prevent the introduction of exotic species” without evaluating any evidence of the efficacy and timeline of these new regulations generally or in particular for the sensitivity of local conditions in the Brownsville area to non-native species, where there are

CO9-25

CO9-26

CO9-26

Section 4.6.2.2 of the final EIS was revised to address the efficacy and timeframe for implementation of updated Coast Guard ballast water regulations. While these regulations may not eliminate all risk of invasive species entering U.S. waters, they would minimize the risk of introducing invasive species into the Project area. Further, LNG carrier traffic would be consistent with the existing use of the BSC and connected waters of the Gulf of Mexico.

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important fisheries, unique ecosystems, and other aquatic life.¹¹⁸

For example, a 2017 study entitled “Potential effects of LNG trade shift on transfer of ballast water and biota by ships” warned of potential “large effects” on the transfer of non-native species from the growing LNG exports from the US even with the existing US regulations:

CO9-26

“Moreover, compliance schedules are based on vessel capacity and construction date, so ships with large ballast water capacity (N5000 m3), such as LNG carriers, have more lag time to meet US regulations. Thus, the massive surge in overseas ballast water predicted by the US LNG export boom could increase propagule supply and invasion risk... even as management efforts seek to reduce organism concentrations.... These changes in magnitude, source, and direction of the LNG trade can have large effects on transfer of nonnative organisms, due to the volume and biotic content of associated ballast discharge to ports.”¹¹⁹

In the DEIS, FERC has not given the requisite “hard look” to these potential “large effects” on fisheries, unique ecosystems, and aquatic resources from the threat of non-native species.

c) Impacts on Fishing Vessel Travel in the Ship Channel

The DEIS determined that “[d]uring operations, LNG carriers calling on the Rio Grande LNG Terminal and other LNG facilities along the BSC may have moving security zones that could preclude other marine vessels from transiting the waterway for *up to 39 hour per week*.”¹²⁰ (emphasis added).

Lengthy and/or frequent delays in access to the ship channel due to LNG traffic could be both costly and life-threatening to the fishing industry. Commercial fishing boats are often out for

CO9-27

¹¹⁸ See Mendoza, R. et al, “Aquatic Invasive Species in the Rio Bravo/Laguna Madre Ecological Region,” Commisison for Environmental Cooperation, Canada (October 2011), attached as Exhibit 44, available at <http://www3.cec.org/islandora/en/item/10259-aquatic-invasive-species-in-rio-bravolaguna-madre-ecological-region-en.pdf>

¹¹⁹ Holzer et al, Potential effects of LNG trade shift on transfer of ballast water and biota by ships, *Science of the Total Environment*, 580 (2017) 1470–1474, attached as Exhibit 45, available at https://www.researchgate.net/publication/311936667_Potential_effects_of_LNG_trade_shift_on_transfer_of_ballast_water_and_biota_by_ships#pf5

¹²⁰ See DEIS, ES-16.

CO9-27

As discussed in section 4.9, the planned transit times of LNG carriers would be communicated to the Coast Guard and Port of Brownsville Harbor Master, to allow for the issuance of advisories to mariners. Mandates require notification to authorities of the expected arrival of an LNG carrier 4 four days in advance, which would allow ample time for commercial vessels to identify alternative routes and/or ports to be used in the event of an emergency.

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extended periods of time, and then return at unexpected times with thousands of pounds of frozen shrimp or fish. Boats may also return early due to illness, injuries, or mechanical problems and need to get to shore quickly. Time is an important resource that is a huge variable in the fishing industry, and thus being forced to wait extended periods of time for LNG traffic could endanger lives and financially harm the fishing industry.

CO9-27

Despite the finding that there could be *up to 39 hours per week* when shrimpers and fishers could not traverse the channel between the harbor where their boats are stored, the DEIS only concludes that there will be a “moderate cumulative impact on marine vessel traffic.”¹²¹ FERC should find a greater impact given the severe harm this would place on the commercial fishing industry. Furthermore, *there is nothing proposed in the DEIS to even attempt to mitigate these impacts.*

The DEIS also acknowledges that dredging will “temporarily reduce the area of the BSC available for vessel transit” for commercial fishing and LNG carrier transit will cause an estimated delay of 3 hours for fishing and shrimping boats in the BSC.¹²²

d) Economic Impacts to Fisheries

There is no analysis of how conversion of essential fish habitats to permanent industry sites and/or how displacement and destruction of aquatic life will impact the commercial fishing industry. This omission is glaring, considering how often this has been a concern during the permitting process of other LNG projects in the past, both in the continental U.S. and abroad. For instance, a 2009 Department of Fisheries study in Australia found that a proposed development of an LNG terminal on the west coast of Australia had the potential to significantly impact all

CO9-28

¹²¹ See DEIS, ES-16.

¹²² DEIS, 4-212.

CO9-28

Each LNG terminal is unique in design and in resource impacts. As described in sections 4.6.2 and 4.6.3 of the EIS, impacts on aquatic resources would be minor and, with implementation of required mitigation, impacts on EFH and the species and life stages that utilize EFH would be minor. Consultation regarding the EFH assessment is complete, and, given the temporary, minor impacts on EFH, NMFS does not have EFH conservation recommendations for the Project. Therefore, section 4.9.4 of the final EIS was revised to clarify that the Project is not expected to impact the yield of commercial fisheries in the Project area.

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CO9 - Sierra Club

fisheries that were active in the immediate and adjacent areas.¹²³ The study predicted there would be reduction in the levels of fishing activity as a result of the LNG port, with “some flow-on effects to the economy of the region.”¹²⁴ Some of the decline, the study predicted, would come about through the environmental changes created by the LNG project, such as the displacement of prawns, mackerel, pelagic gamefish, and pearling operations.¹²⁵

CO9-28

The increased vessel traffic to and from the export terminal,¹²⁶ in tandem with the destruction of essential fish habitats, would further interfere with commercial fishing operations. This is one of the primary effects expected to result from similar LNG projects.¹²⁷ For instance, experts commenting on Oregon’s Jordan Cove Energy Project said the project would have undermined “decades of work to protect fishing opportunities” off the coast of Oregon, which risks undoing the advances that came about after “billions of dollars” were invested to restore salmon habitat in the region.¹²⁸

CO9-29

The DEIS also fails to consider the interplay between the tourism and commercial fishing and shrimping industries. Damage to the commercial fishing and shrimping industries could also lead to a decrease in the number of tourists, which in turn could decrease the number of customers available to local fishers and shrimpers. Not to mention, tourists may be dissuaded from buying locally-caught shrimp in an area dominated by petrochemical industry. While studies about this form of “seafood tourism” are not readily available about Texas, LNG-friendly coastal areas such

CO9-30

¹²³ Guy Wright and Christian Pike, *Fishing Industry Impact Study: James Price Point Proposed Liquefied Natural Gas Precinct*, Fisheries Occasional Publication No. 78, iii-iv, 2010, attached as Exhibit 46.

¹²⁴ *Id.* at iv.

¹²⁵ *Id.* at ix.

¹²⁶ See, supra, Section on TOURISM.

¹²⁷ Attached as Exhibit 47, available at http://www.beg.utexas.edu/files/energyecon/global-gas-and-lng/CEE_offshore_LNG.pdf

¹²⁸ “Science Shows Vital Fish Habitat Threatened by Proposed Oregon LNG Terminal,” Columbia Riverkeeper (February 5, 2015), attached as Exhibit 48, available at <https://www.columbiariverkeeper.org/news/2015/2/science-shows-vital-fish-habitat-threatened-proposed-oregon-lng-terminal>. See also Eric de Place and Paelina DeStephano, “Jordan Cove Energy Project, LNG Facility May Harm Water Quality, Salmon Runs,” Sightline Institute (August 1, 2018), attached as Exhibit 49, available at <https://www.sightline.org/2018/08/01/jordan-cove-energy-project-oregon-could-harm-water-quality-salmon-runs/>.

CO9-29

Each LNG terminal is unique in design and in resource impacts. As described in sections 4.6.2 and 4.6.3 of the EIS, impacts on aquatic resources (including impacts from LNG carriers including ballast water exchange and cooling water discharge) would be minor. Appendix M includes a revised EFH assessment for the Project, which includes an assessment of habitats and managed species with the potential to occur at the Project site based on available data and field survey results for habitats in the Project area. Consultation regarding the EFH assessment is complete, and, given the temporary, minor impacts on EFH, NMFS does not have EFH conservation recommendations for the Project. Therefore, section 4.9.4 of the final EIS was revised to clarify that the Project is not expected to impact the yield of commercial fisheries in the Project area.

CO9-30

Impacts on commercial fishing are addressed in section 4.9.4. While minor, temporary and permanent impacts on commercial fishing in the BSC would occur from construction and operation of the LNG Project, the majority of the commercial fishing industry is based on offshore shrimping and fishing. As such the Project is unlikely to result in a measurable effect on commercial landings in the Project area. As discussed further in section 4.9.3, the Project would result in temporary to short-term, visitation patterns may change, but the number of visits to the Project area would likely not.

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as New South Wales in Australia find that domestic tourists expect to eat local seafood when traveling to the coast.¹²⁹

Not accounting for the effects of the project's impact on the commercial fishing and shrimping industries sufficiently is, given the economic importance of these fisheries and the adverse effects created by similar LNG projects elsewhere.

CO9-30

e) Additional Mitigation for Impacts to Fisheries Must be Proposed

Further highlighting the absence of a discussion on the project's impact on commercial fishing, other LNG terminal projects in the past have tried to mitigate the impact on commercial and recreational fisheries in the surrounding areas. For instance, the 2005 approval of two offshore LNG terminals in Massachusetts was conditioned on a mitigation package that required the companies involved to provide \$16 million to mitigate impacts to "commercial fishermen and lobstermen," \$14 million to mitigate impacts to public trust interests, \$9 million to mitigate impacts to marine habitat and resources, and \$8 million to mitigate impacts to marine mammals.¹³⁰

CO9-31

IV. The DEIS Fails to Adequately Assess Impacts on Sensitive Species

A. NEPA Obligations Respecting Wildlife and Listed Species

Under the Natural Gas Act, the Commission cannot approve RG Developers' applications if it determines that the construction and operations "will not be consistent with the public

¹²⁹ Kate Barclay and Michelle Voyer, "Valuing Coastal Fisheries," University of Technology Sydney, October 2016, attached as Exhibit 50, available at <https://www.uts.edu.au/about/faculty-arts-and-social-sciences/research/fass-research-projects/valuing-coastal-fisheries>

¹³⁰ Commonwealth of Massachusetts, "Romney Approves Two Offshore LNG Terminals," January 2005, attached as Exhibit 51, available at https://www.rigzone.com/news/oil_gas/a/39328/romney_approves_two_offshore_lng_terminals/.

CO9-31

Each LNG terminal is unique in design and in resource impacts. The comment pertains to offshore LNG import terminals that were designed to import natural gas (the Northeast Gateway and Neptune LNG Projects off the coast of Massachusetts), and therefore impacts are not comparable to the proposed LNG Terminal. Impacts on commercial fishing are addressed in section 4.9.4.1 of the EIS.

interest” or are not required by the “public convenience and necessity.”¹³¹ The determination of whether a proposed facility is consistent with the public interest, in turn, depends upon the environmental impact of the facility.¹³² Moreover, the Commission may only approve an LNG application (whether in whole or part) “with such modifications and upon such terms and conditions as the Commission find[s] necessary or appropriate” to ensure consistency with the public interest.¹³³ Stated another way, the Commission must consider whether impacts that are unavoidable and irreducible render the proposal inconsistent with the public interest.

The National Environmental Policy Act (“NEPA”) has two objectives: (1) it requires an agency “to consider every significant aspect of the environmental impact of a proposed action”; and (2) “it ensures that the agency will inform the public that it has indeed considered environmental concerns in its decisionmaking process.”¹³⁴ “Part of the harm NEPA attempts to prevent in requiring an EIS is that, without one, there may be little if any information about prospective environmental harms and potential mitigating measures.”¹³⁵ Notably, the Council on Environmental Quality (“CEQ”) Regulations implementing NEPA state that “NEPA procedures *must insure that environmental information is available to public officials and citizens before decisions are made and before actions are taken.*”¹³⁶ Thus, NEPA compliance informs the Commission’s public interest determination under the Natural Gas Act and helps ensure that it will minimize the environmental harm resulting from the development of LNG facilities, and—more importantly—will avoid harms that are so great as to outweigh the benefits of constructing a terminal in a particular location.

¹³¹ 15 U.S.C. §§ 717b(a), 717f(c).

¹³² See *Sabine Pass Liquefaction Expansion*, 151 FERC ¶ 61012, at 27 n.32 (Apr. 6, 2015) (explaining that the Commission’s public interest review evaluates the environmental impacts of the siting, construction, and operation of the export facility).

¹³³ 15 U.S.C. § 717b(e)(3)(A).

¹³⁴ *United States v. Coal. for Buzzards Bay*, 644 F.3d 26, 31 (1st Cir. 2011) (internal citations omitted).

¹³⁵ *Winter v. Natural Res. Def. Council, Inc.*, 555 U.S. 7, 23 (2008).

¹³⁶ 40 C.F.R. § 1500.1(b) (emphasis added).

Environmental impact statements “shall...be supported by evidence demonstrating that agencies have made the necessary environmental analyses” to avoid or minimize any possible adverse effects of their actions upon the quality of the human environment.¹³⁷ Moreover, an EIS must “state how alternatives considered in it and decisions based on it will or will not achieve the requirements of...other environmental laws and policies.”¹³⁸ The adequacy of an agency’s EIS turns on:

- (1) whether the agency in good faith objectively has taken a hard look at the environmental consequences of a proposed action and alternatives;
- (2) whether the EIS provides detail sufficient to allow those who did not participate in its preparation to understand and consider the pertinent environmental influences involved; and
- (3) whether the EIS explanation of alternatives is sufficient to permit a reasoned choice among different courses of action.¹³⁹

The Commission has promulgated a series of regulations to “implement [FERC’s] procedures” under NEPA and “supplement the regulations of the [CEQ].”¹⁴⁰ These regulations require the Commission to identify and assess the extent of the impact of each proposed facility on wildlife, such as threatened and endangered species—and including a discussion of what mitigation is necessary to ensure consistency with the public interest, or whether alternative sites for the export terminal would avoid or reduce those impacts.¹⁴¹ Moreover, NEPA also requires

¹³⁷ 40 C.F.R. § 1500.2(b).

¹³⁸ 40 C.F.R. §1502.2(d).

¹³⁹ *Davis Mountains Trans-Pecos Heritage Ass’n v. Fed. Aviation Admin.*, 116 Fed. Appx. 3, 8-9 (5th Cir. 2004).

¹⁴⁰ 18 C.F.R. § 380.1; *see generally* 18 C.F.R. Part 380.

¹⁴¹ *See, e.g.*, 18 C.F.R. § 380.12(e) (requiring identification of listed species *and* discussion of potential mitigation measures); § 380.13(b) (describing required content for a biological assessment and incorporating those requirements into NEPA analysis); § 380.15 (requiring that the “siting...of facilities shall be undertaken in a way that avoids or minimizes effects on...wildlife values.”). Regarding the biological assessment incorporated into FERC’s NEPA procedures via 18 C.F.R. § 380.13(b), the regulations provide that it “must contain the following information for each species...:”

(A) Life history and habitat requirements;

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that the Commission determine the cumulative impacts of developing the three facilities currently proposed for the Brownsville Ship Channel area—including cumulative effects on wildlife and listed species.¹⁴²

The Commission erroneously seeks to defer responsibility regarding its NEPA obligations. The DEIS recommends that “the FERC staff completes any necessary ESA consultation with these agencies prior to construction.”¹⁴³ An action agency cannot satisfy the NEPA requirement to identify the extent of impact to listed species in the EIS merely by stating that the project will ultimately incorporate the results of the Section 7 consultation process. Because NEPA requires that the extent of the impacts be identified and made available for public review (42 U.S.C. § 4332(2)(G)), the reliance on the content of a yet to be developed Biological Opinion cannot satisfy NEPA’s requirement to provide the public with an opportunity for comment on the actual extent of the impacts that will occur.¹⁴⁴

CO9-32

B. The DEIS Fails to Adequately Assess the Project’s Significant Effects on Listed Species

A review of the DEIS and materials provided by the Applicants reveals that the analysis contains insufficient information to fully determine the extent of adverse effects on listed species, or to determine whether proposed mitigation measures are sufficient to eliminate, avoid, or

CO9-33

- (B) Results of detailed surveys to determine if individuals, populations, or suitable, unoccupied habitat exists in the proposed project’s area of effect;
- (C) Potential impacts...that could result from the construction and operation of the proposed project...; and
- (D) Proposed mitigation that would eliminate or minimize potential impacts.

¹⁴² 18 C.F.R. § 380.13(b)(5)(ii) (emphasis added).

¹⁴³ 18 C.F.R. §380.12(b)(3).

¹⁴⁴ DEIS 5-10.

¹⁴⁴ Cf. *San Luis & Delta-Mendota Water Auth. v. Jewell*, 747 F.3d 581, 649-650, 653 (9th Cir. 2014) (concluding that the implementation of a Biological Opinion was not exempt from NEPA requirements because “[w]e cannot say that Section 7 of the ESA renders NEPA ‘superfluous’ when the statutes evaluate different types of environmental impacts through processes that involve varying degrees of public participation.”).

CO9-32

While some information was still pending at the time of issuance of the draft EIS, the lack of this final information does not deprive the public of a meaningful opportunity to comment on a substantial adverse environmental effect of the Project or a feasible way to mitigate or avoid such effect. The draft EIS included sufficient detail to enable the reader to understand and consider the issues raised by the Project and addresses a reasonable range of alternatives. Completion of the Section 7 ESA consultation process would include completion of field surveys, which is not always possible prior to issuance of a FERC Certificate due to restricted access to construction workspaces.

CO9-33

The species assessments were conducted through review of applicant-provided information, independent research, and coordination with the FWS, which is a cooperating agency on the EIS. Further, we have supplemented the listed species discussions as requested by the FWS in its comments on the draft EIS/BA, which include additional information on cumulative impacts on ocelot habitat. Section 7 consultation with the FWS and NMFS is ongoing and will be finalized prior to Project construction, if approved.

minimize adverse effects on those species.¹⁴⁵

CO9-33

1. Endangered Ocelot

The ocelot (*Leopardus pardalis*) is an endangered species with two nearby U.S. populations, one at the Laguna Atascosa National Wildlife Refuge, which is approximately 200 feet from the RG LNG site, and the other some 20 miles north of the refuge on private ranchland in Kenedy and Willacy Counties. FWS and NGOs have been working for decades to protect and restore the ocelot in the U.S. The DEIS states that there will be “significant” effects of the project on the ocelot “from the loss and/or decrease in suitability of habitat and the potential increase in vehicular strikes during construction.”¹⁴⁶ Moreover, the DEIS recognizes that “loss of potential habitat at the LNG Terminal site is in opposition to the recovery actions identified in the [ocelot] recovery plan.”¹⁴⁷

The DEIS understates the impact of the project on the north-south ocelot movement corridor. For decades, FWS and partner organizations have been purchasing land and arranging easements with the goal of protecting habitat and wildlife corridors that would maintain connections between ocelot populations in the U.S., including habitat north and south of the Brownsville Shipping Channel (“BSC”), with the ultimate vision of connectivity to the population in Tamaulipas, Mexico.¹⁴⁸ The cumulative effects of the proposed LNG projects along the channel, particularly RG LNG and Annova LNG, would be to greatly reduce the width of the existing corridor, restricting it to a band approximately 1,000 feet wide adjacent to lighted, noisy

CO9-34

¹⁴⁵ In addition to the impacts discussed below, we adopt and incorporate in full Defenders of Wildlife’s Scoping Comments on Rio Grande LNG (FERC Docket #PF 15-20-000), Annova (FERC Docket #PF 15-15-000); Texas LNG (FERC Docket #PF 15-14-000), dated September 3, 2015, attached to Defenders of Wildlife’s Motion to Intervene, FERC Docket No. 16-454, Accession No. 20160609-5177.

¹⁴⁶ DEIS 4-423.

¹⁴⁷ DEIS 4-150.

¹⁴⁸ See, e.g., Exhibit 52, available at <https://www.kveo.com/news/local-news/-11-million-for-conservation-projects/1614349403>.

CO9-34

As discussed in section 4.7.1.4, the Project would not affect areas identified for potential inclusion in the Coastal Corridor Acquisition Area. Through consultations regarding the loss of potential habitat at the LNG Terminal site, the FWS has recommended that RG Developers mitigate this habitat impact through the preservation of land adjacent to other conservation lands. Final mitigation plans would be determined through completion of the ESA consultation process. Although these consultations have not been completed, no construction of the Project could take place without finalized consultation between the FERC and FWS (and NMFS, as appropriate) regarding impacts on listed species. The Project would not directly impact the established wildlife corridor (which is about 0.5 mile from the proposed fence line) and modeled noise increases would be negligible at that distance. Further, as yet there has been no documented use of the corridor and SH-48 passage by ocelots. The continued designation of the wildlife corridor between the BSC and SH-48 is not a related activity to the proposed Project and removal of its designation is not included as part of the Project scope; although the corridor lease expires in 2023, it is not reasonably foreseeable to expect that the lease and designation would not be renewed, specifically in light of the coastal corridor that is being developed/acquired. As the Annova LNG Project requires federal authorization, consultation is also underway between FERC and the FWS, as required per Section 7 of the ESA to determine the impacts of that project.

CO (Companies and Organizations)

CO9 - Sierra Club

LNG terminals that ocelots are likely to avoid. For an ocelot to cross the BSC, once the LNG plants are under construction, it would have to approach the lighted, noisy plants via a narrow easement of 1,000 feet on either side of the BSC, swim the channel, and then exit via another easement. In addition, ocelots would have to use culverts to cross access roads. It is unlikely that ocelots would successfully run this gauntlet and therefore likely that the plants would permanently cut connection between ocelots north and south of the BSC. RG Developers' documentation and the DEIS fail to adequately acknowledge the large role it would play in cutting this vital corridor and proposes nothing to offset this loss of connectivity that may jeopardize long-term viability of the U.S. ocelot population by substantially reducing the area available to ocelots and ending hope of eventual gene flow from the Mexican population. Moreover, while the DEIS acknowledges that the designated wildlife corridor easement which the Navigation District leased to FWS lapses in 2023, it fails to analyze how the loss of this corridor would impact the ocelot. The EIS should disclose and evaluate the cumulative effects of not only the three LNG projects, but the potential loss of the designated wildlife corridor easement, as well. This failure to fully disclose and analyze impacts on the ocelot violates NEPA's "hard look" requirement and prevents the public from "understand[ing] and consider[ing] the pertinent environmental" effects of RG Developers' proposed terminal and pipeline.¹⁴⁹

Additionally, RG Developers have not specified what off-site mitigation acres they would create, restore, or protect, so it is impossible to evaluate whether mitigation actions would avoid, eliminate, or minimize the significant impacts to the ocelot. Given the disastrous effect this project would have on long-term plans for ocelot recovery, if sufficient mitigation is even possible, it should be substantial. To be sufficient, ocelot mitigation should offset at least two main degradative effects: (1) loss of ocelot habitat *per se*, primarily thorn scrub, and (2) loss of

¹⁴⁹ *Davis Mountains*, 116 Fed. Appx. at 8-9; *see also* 18 C.F.R. §§ 380.12(e) & 380.13(b)(5)(ii)(C).

CO9-34

CO9-35

CO9-35

Although the draft EIS disclosed the Applicant's proposed mitigation for wetland loss, those plans are not final and have not been agreed to by the COE and the EPA, which have primary responsibility over wetland mitigation. Further, RG Developers, in response to our recommendation in the draft EIS have consulted with the FWS regarding mitigation for lost ocelot habitat, and the FWS has recommended preservation of lands outside the Loma Ecological Preserve and adjacent to other conserved lands; final mitigation plans are still being developed and would be determined through completion of the ESA consultation process.

connectivity between existing and/or potential ocelot habitat north and south of the BSC.

Regarding the first issue, the DEIS states that RG Developers intends to mitigate through protection acreage within the Loma Ecological Preserve (“LEP”), but it does not specify where.¹⁵⁰

So far as it is possible to tell from the DEIS, these mitigation acres could be predominantly wetland or mudflats with insufficient ocelot habitat—and perhaps containing no ocelot habitat at all. Because there would not be enough ocelot habitat within the LEP to provide adequate mitigation acres, the DEIS must investigate the possibility that RG Developers protect a substantial area near the two existing populations north of the BSC, thereby contributing to long-term demographic and genetic diversity of U.S. ocelots. The failure to include this analysis is insufficient to satisfy NEPA requirements.

Regarding the second issue, the EIS must specify what measures may be taken to compensate for loss of connectivity. As described above, blocking connectivity would effectively end the long-term FWS and NGO plan of ensuring connectivity north and south of BSC, as well as ensuring connectivity with ocelots in Mexico.¹⁵¹ The EIS must evaluate both these effects and should include, at minimum, population viability assessments for scenarios that would include connection with Mexico. Additionally, another reasonable mitigation practice that must be evaluated would be purchasing private lands to help protect a corridor between the Laguna Atascosa population and the population to the north on private ranches. The DEIS fails, however, to adequately consider or address any mitigation that would provide reasonable and sufficient offset for lost connectivity. Based on this failure, the Commission has not taken the “hard look” at ocelot impacts necessary to comply with NEPA.¹⁵²

CO9-35

¹⁵⁰ DEIS 4-150.

¹⁵¹ U.S. Fish and Wildlife Service. 2016. Recover Plan for Ocelot (*Leopardus pardalis*), attached as Exhibit 53.

¹⁵² See, e.g., *Davis Mountains*, 116 Fed. Appx. at 8-9.

2. Threatened Piping Plover and Red Knot

The DEIS notes that there is wintering habitat for both the federally-listed piping plover (*Charadrius melodus*) and red knot (*Calidris canutus rufa*) on the project site itself, as well as wintering critical habitat for piping plover on the south bank of the BSC, where the bird could be negatively affected by noise from the LNG plants. The DEIS states that the red knot and the piping plover may lose foraging habitat, but does not anticipate adverse effects on either bird, because they can supposedly move to alternative habitat. We question the validity of this assumption. These birds are likely imperiled because of the cumulative effects of habitat loss that in turn results in inadequate food supplies. For example, the large decline in red knot that led to its listing as threatened in 2015 was caused primarily by a decline in food availability when the birds arrived on migration in Delaware Bay.¹⁵³ If food is similarly limited for these birds along the South Texas coast, there is reason to assume that alternative habitat with adequate food is not available, resulting in significant adverse effects on the piping plover and red knot. Accordingly, the DEIS's conclusion that the project is not likely to adversely affect the red knot would be incorrect. Further, because the DEIS does not adequately evaluate the extent to which alternative habitat with available food exists, the Commission has not taken a "hard look" at the impacts to these birds.¹⁵⁴

Second, cumulative loss of habitat by the LNG plants and other development in the area may decrease feeding effectiveness by altering the distribution of wetland habitat. Shorebirds have been found to be more effective at feeding with lower search costs and exploit more feeding sites when distance between wetlands decreases and the percentage of the landscape occupied by

¹⁵³ See generally U.S. Fish and Wildlife Service, Red Knot (2018), available at <https://www.fws.gov/northeast/redknot/>.

¹⁵⁴ See *Davis Mountains*, 116 Fed. Appx. at 8-9.

CO9-36

The EIS does not conclude that there would be no adverse effects on either bird, rather that adverse effects would be discountable or insignificant. Foraging habitat is not a limiting factor in the area of the Project given the presence of designated critical habitat for the piping plover in close proximity to the proposed site. Designated critical habitat cannot be adversely modified by development and therefore will always be available for use by the piping plover and red knot. The decline in food availability for the red knot in Delaware Bay was not related to the loss of foraging habitat, rather the loss of its primary prey due to increased fishing pressures which decreased its availability.

CO9-37

As indicated in section 4.13.2.5, critical habitat for piping plovers, and therefore foraging habitat for piping plovers and red knot, is prevalent in the Project area and is protected from adverse modification due to its designation as critical habitat. As this habitat would not be directly disturbed by any of the cumulatively assessed projects, we have found that no significant cumulative effects on the species would occur.

CO9-36

CO9-37

wetlands increases.¹⁵⁵ Thus, the RG LNG plant may contribute to what is effectively an overall loss in available food in the general area. The DEIS does not adequately evaluate this issue or determine whether mitigation is necessary to offset the loss of feeding habitat for piping plover and red knot.

CO9-37

Finally, regarding the piping plover, the DEIS recognizes the potential for loss of critical habitat due to the placement of dredged material, but only analyzes the impacts of increased sound levels.¹⁵⁶ RG Developers cannot rely on the fact that an entirely different project—the Brazos Island Harbor Improvement Project—supposedly lacked adverse effects to support the conclusion that dredged material from RG Developers’ project would not affect the piping plover. In that project, FWS was able to concur because it was able to determine and evaluate the planned mitigation.¹⁵⁷ Here, however, neither RG Developers or the Brownsville Navigation District have determined where the LNG projects’ dredged materials will be placed. Thus, neither FWS nor the public can determine the impacts of the dredged material disposal. Moreover, neither can evaluate how well unspecified mitigation measures will avoid, eliminate, or minimize those impacts. The failure to fully analyze potential impacts to the piping plover, and the absence of any proposed mitigation measures in the DEIS again violates NEPA’s “hard look” requirement.¹⁵⁸

CO9-38

3. Endangered and Threatened Sea Turtles

The project documentation also contains insufficient information to determine whether there are sufficient mitigation measures to minimize the project’s impacts on listed sea turtles. Sea turtle species that may be present within the project’s general area include Kemp’s ridley, hawksbill, leatherback, loggerhead, and green sea turtles. All these species are endangered except

¹⁵⁵ Farmer, A.H. and A.H. Parent. 1997. Effects of the Landscape on Shorebird Movements at Spring Migration Stopovers. *The Condor* Vol. 99, No. 3 (August 1997), pp. 698-707, attached as Exhibit 54.

¹⁵⁶ DEIS 4-142.

¹⁵⁷ DEIS 4-142.

¹⁵⁸ *Davis Mountains*, 116 Fed. Appx. at 8-9.

CO9-38

The FWS is able to consider the placement of dredged materials within critical habitat because those locations were identified in the draft EIS as possible placement areas (see sections 4.2.3 and 4.7.1.3). Section 4.7.1.3 has been revised to further clarify impacts on plovers from possible dredged material placement in critical habitat. Further, and as discussed in section 4.7.1.3, the final placement area(s) would be coordinated with the FWS and additional resource agencies prior to any approved use.

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for the green, whose population off the Texas coast is classified as threatened. Critical habitat for the loggerhead turtle has been mapped offshore.

RG Developers primarily focus on pile-driving for its adverse effect on sea turtles, but collision with ships is perhaps a more significant risk associated with the project.¹⁵⁹ Turtles are vulnerable because they surface to breathe; often bask, feed; and mate near the surface; and are more vulnerable during cold spells when they are unable to move as well. They are also more vulnerable when ships travel at high speed because the turtles cannot take effective evasive action.¹⁶⁰ The bodies of most struck turtles are not recovered, but the number of dead and injured turtles that wash up on shore could be an indication of the frequency of collisions. The NOAA collects statistics on such strandings off the Texas coast, although these statistics are not broken down by cause of death. In Zone 21 of NOAA's Gulf of Mexico sea turtle coastal habitat zoning, the number of strandings of all threatened or endangered species from 2010 to 2018 was 3390. This includes the area of Padre Island and South Padre Island (offshore and in-shore strandings).¹⁶¹ Some proportion are likely due to collision and could increase as a greater number of ships enter the Brownsville ship channel arriving at the three new LNG terminals. To comply with NEPA, the EIS must analyze this issue.

Turtles are known to be present in high density in this area, as shown in the map below, so many ship-turtle collisions are likely.¹⁶²

¹⁵⁹ See, e.g., NOAA Fisheries Service & U.S. Fish and Wildlife Service. 2008. Recovery Plan for the NW Atlantic Population of the Loggerhead Sea Turtle, attached as Exhibit 55; Denkinger et al. 2013. Are boat strikes a threat to sea turtles in the Galapagos Marine Reserve? Ocean & Coastal Management Volume 80, pp 29-35, Exhibit 56.

¹⁶⁰ Hazell et al. 2007. Vessel speed increases collision risk for the green turtle *Chelonia mydas*. Endangered Species Research Volume 3, pp. 105-113, attached as Exhibit 57.

¹⁶¹ Data from NOAA Southeast Fisheries Science Center, available at <https://grunt.sefsc.noaa.gov/stssnrep/SeaTurtleReportI.do?action=reportquery>. Zone 21 covers roughly 60 miles of Texas coastline from slightly north of Port Mansfield through the border with Mexico.

¹⁶² Shaver D. et al. 2016. Migratory corridors of adult female Kemp's ridley turtles in the Gulf of Mexico. Biological Conservation, Vol. 194, pp 158-167, attached as Exhibit 58.

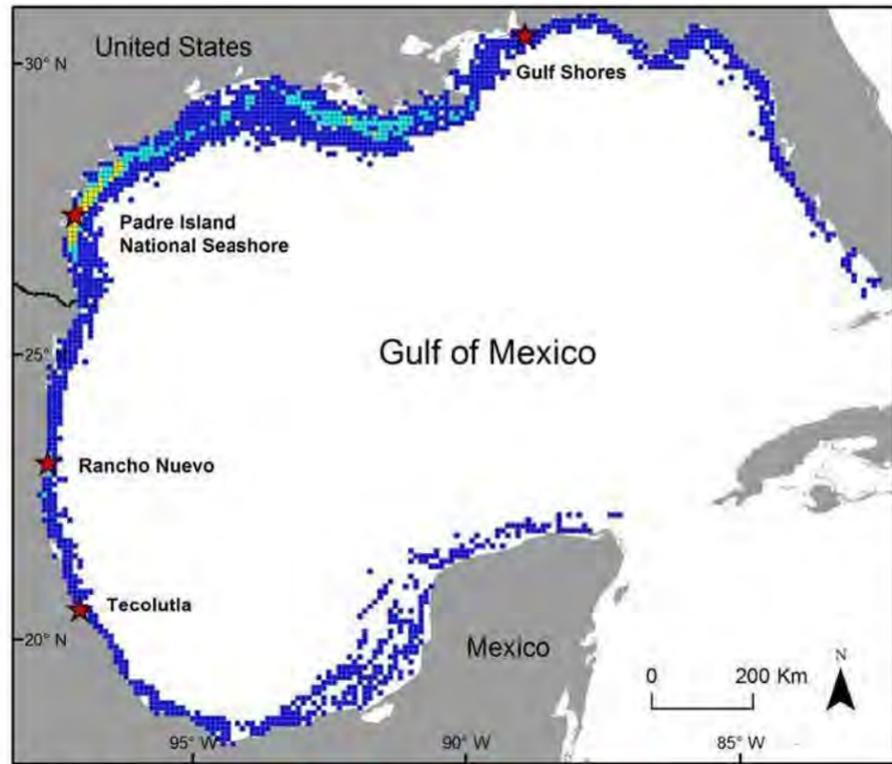
CO9-39

Section 4.7.1.1 has been updated to further assess the potential for LNG vessels calling at the proposed Project to result in collisions with sea turtles.

CO9-39

CO (Companies and Organizations)

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Turtle days 1 - 7 8 - 15 16 - 33 34 - 56

The Rio Grande LNG project and other LNG projects planned along the BSC will significantly increase the amount of ship traffic in the area, thereby increasing the probability of collision and turtle death. This may especially negatively impact nesting beaches for the Kemp's ridley, which nest along Boca Chica beaches in South Padre island at the entrance to the ship channel. The project documentation fails to quantify the increased vulnerability to vessel strikes (e.g., DEIS, 4-133), and therefore—contrary to NEPA's requirements—it is impossible to determine whether vessel strikes associated with the project are causing significant adverse effects on any of the listed sea turtle species.

CO9-40

CO9-40

Section 4.7.1.1 has been updated to further assess the potential for LNG vessels calling at the proposed Project to result in collisions with sea turtles. FERC has no jurisdiction over the speed at which LNG carriers calling at the proposed Port travel during transit.

DEIS Comments of Save RGV from LNG, Shrimpers and Fisherman of the RGV, Sierra Club, and Vecinos para el Bienestar de la Comunidad Costera in CP16-454 and CP16-455 Page 50

Moreover, the documentation shows insufficient evaluation of mitigation measures related to sea turtles. Turtle mortality from collisions can be reduced if ships travel more slowly and if ships avoid turtles. Such avoidance guidelines have been promulgated by the National Marine Fisheries Service (NMFS).¹⁶³ These guidelines are referred to in the DEIS which notes that compliance is voluntary. There are additional costs associated when ships travel slowly, as has been calculated for the right whale seasonal management areas off the east coast near Boston, Massachusetts.¹⁶⁴ Based on these increased costs, ships have an economic incentive not to comply with the voluntary NMFS guidelines, and there is little reason to believe they would do so, which RG Developers recognizes. The DEIS notes that, although RG LNG's support vessels would adhere to the NMFS guidelines, the company has no control over operators of LNG carriers or tugs.¹⁶⁵ Based on the information available in the DEIS, it appears unlikely that RG Developers' proposed mitigation would prevent significant impacts to listed species of sea turtles due to increased vessel strikes. Regardless, the lack of adequate evaluation of the issue does not comply with NEPA.¹⁶⁶

CO9-40

Other measures are available that may mitigate impacts such as vessel strikes. For example, a speed control area such as the one set for right whales is precedent for a mandatory vessel speed limit.¹⁶⁷ Because increased ship traffic due to the LNG sites would likely increase mortality of endangered and threatened turtles, NEPA requires the EIS to demonstrate the Commission's "hard look" at all such measures to avoid, eliminate, or minimize significant effects on listed sea turtles, including creation of a mandatory ship speed control area in the

¹⁶³ NOAA Fisheries Service, Southeast Regional Office. 2008. Vessel Strike Avoidance Measures and Reporting for Mariners, attached as Exhibit 59.

¹⁶⁴ NOAA Fisheries Service. 2012. Economic Analysis of North Atlantic Right Whale Ship Strike Reduction Rule, attached as Exhibit 60.

¹⁶⁵ DEIS 4-133.

¹⁶⁶ *E.g., Davis Mountains*, 116 Fed. Appx. at 8-9.

¹⁶⁷ NOAA Fisheries Service. 2018. Compliance Guide for Right Whale Ship Strike Reduction Rule (50 CFR 224.105), attached as Exhibit 61.

vicinity of the mouth of the BNC sufficiently large to significantly reduce turtle mortality.

CO9-40

C. The DEIS Fails to Adequately Assess Mitigation for Wildlife

There are two additional problems—with respect to wildlife—with RG Developers’ proposed mitigation that violate the Commission’s obligations under NEPA. First, the project site includes a mosaic of different habitat types that include over 520 upland acres of Gulf Coast salty prairie, South Texas salty thorn scrub, South Texas loma grassland, South Texas loma evergreen shrubland, as well as roughly 460 acres of varying types of wetlands.¹⁶⁸ These different habitats are related to and support different endangered or threatened species. For example, thorn scrub is ocelot habitat, while salty prairie is habitat for Aplomado falcon. The compensatory mitigation, as currently proposed, does not distinguish between these habitat types, and it does not ensure mitigation for each habitat type. There is no “accounting,” for example, that links the number of acres of thorn scrub that would be destroyed with the number of acres that would be created or preserved as mitigation. Without knowing what types of habitat will be protected through the proposed mitigation, the Commission is unable to determine (and therefore has not taken a “hard look” at) whether the proposed mitigation will avoid, eliminate, or minimize impacts to any individual listed species or other wildlife.¹⁶⁹

CO9-41

Second, RG Developers, Texas LNG, and Annova LNG are all proposing that a large part of their mitigation be perpetual protection through an easement to be granted by the Brownsville Navigation District (“Navigation District”) within what is now the Loma Ecological Preserve. According to RG Developers, the current FWS lease on the LEP was granted by the Navigation District as mitigation for a previous development project. If a new lease is granted to RG

CO9-42

¹⁶⁸ See Table 2-1 of RG Developers’ Mitigation Alternative Analysis, FERC Docket No. 16-454, Accession No. 20180419-5210 at 910.

¹⁶⁹ *Contra* 18 C.F.R. § 380.12(e)(7); see also *Davis Mountains*, 116 Fed. Appx. at 8-9.

CO9-41

We disagree. Although vegetation classifications were condensed for ease of public use, the fine scale data were provided and were assessed as part of the NEPA process. For example, figure 4.5.1-1 specifically identifies the finer scale vegetation communities within the LNG Terminal site. Similar habitat mapping is available for the full Project on FERC’s docket for review (see appendices 3C, 3D, and 3E of the application at accession number 20160505-5179), although some Project workspaces have been modified since these original maps were created. Further, impacted acreage associated with the finer scale vegetation communities is available at accession number 20190222-5166. Mitigation has not been definitively determined for impacts on various habitats; however, these discussions are ongoing for wetlands (see section 4.4.2.4), ocelots (see section 4.7.1.4), and northern aplomado falcons (see section 4.7.1.3). As mitigation discussions are ongoing as part of federal requirements under the CWA and ESA, construction of the Project, if approved, could not occur until the applicable permits and consultations are complete, which includes finalization of any mitigation deemed necessary by the agencies charged with the protection of various resources.

CO9-42

As described in section 4.4.2 of the EIS, wetland mitigation plans are part of the permitting process associated with Section 404 of the CWA. RG LNG’s final wetland mitigation plans would be developed and submitted to the COE, and would be implemented in addition to the construction mitigation measures outlined in RG LNG’s Procedures and the measures described in the EIS. Construction of the LNG Terminal would not commence prior to finalization of the wetland mitigation plans and issuance of the COE’s CWA Section 404/Section 10 permit. Compensatory or offsite mitigation is not required for general wildlife habitat; however, as discussed in sections 4.7.1.3 and 4.7.1.4, any mitigation for habitat loss for the ocelot or northern aplomado falcon would be determined through completion of the ESA consultation process. Species-specific habitat mitigation would not necessarily occur within the Loma Ecological Preserve, and recent consultation records between the FWS and the applicant indicate that the applicant is assessing other mitigation sites (see sections 4.7.1.3 and 4.7.1.4).

Developers for protection within the LEP claiming the existing FWS lease will expire in 2023 (thus removing protection for the Preserve), then the Navigation District and/or its clients will have collectively received double mitigation credit for the same area. Further, as discussed above, nothing in the record shows that wetlands in the LEP will compensate for lost habitat for individual species—especially the ocelot. At minimum, to satisfy NEPA requirements, the project documentation should evaluate whether purchasing or obtaining a perpetual conservation easement on other lands, such as those north of the Brownsville Shipping Channel would better avoid, eliminate, or minimize impacts to listed species and wildlife in the project area.

CO9-42

V. The DEIS Fails to Take a Hard Look at Wetlands Impacts

334.7 acres of wetlands would be within the construction footprint of the Rio Grande LNG Terminal and pipeline facilities. DEIS 4-58. The Terminal will cause “permanent loss” of 182.4 of these, *id.*; further wetlands will be permanently deliberately altered by the pipeline, as Applicants will permanently clear trees in a 30 foot corridor, and mow all vegetation in a 10 corridor, along the right-of-way, including through wetlands. DEIS 4-64. Beyond these intentional changes, other wetlands will be temporarily or permanently degraded, as restoration of disturbed wetlands will take years to complete and is not expected to fully restore original conditions.¹⁷⁰

CO9-43

The DEIS violates NEPA because it fails to take a hard look at reasonable alternatives regarding reduction and mitigation of these alternatives, and because the DEIS’s assertion that wetland impacts will be mitigated to insignificance is unsupported.

A. The DEIS Fails to Consider Reasonable Facility Design and Siting Alternatives That Would Reduce Wetland Impacts

An EIS must include a robust analysis of alternatives to the proposed action: this

¹⁷⁰ See DEIS 2-30 to 2-31; 4-63 (restoration will not begin until both pipelines are complete, and then may take three years); *id.* at 4-63 (restoration will be deemed successful if 80% of vegetative cover restored).

CO9-43

The Project, as designed, takes into consideration all safety and environmental factors, not just wetlands. As stated in section 4.4.2 of the EIS, the LNG Terminal facilities were sited in a manner that would minimize impacts on wetlands; and as described in its application, RG LNG reviewed several layout alternatives to minimize impacts on wetlands. Section 4.4.2 of the EIS also describes the avoidance and mitigation measures RB Pipeline would implement to minimize wetland impacts, including installing the pipeline via horizontal directional drill (HDD) to avoid impacts on mangrove wetlands and reducing the construction right-of-way width in wetlands. RG LNG would be required to obtain the applicable COE permits for permanent loss of wetland habitat and implement any mitigation measures required by the COE for that loss.

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CO9 - Sierra Club

discussion is “the heart of the [EIS]” and must “provid[e] a clear basis for choice among options.” 40 C.F.R. § 1502.14. The Clean Water Act also requires evaluation of alternatives that would reduce wetland impacts. 40 C.F.R. § 230.10(a). Although these two requirements are similar, *id.* § 230.10(a)(4), the Clean Water Act goes beyond NEPA’s procedural requirements and imposes substantive obligations to actually adopt reasonable less damaging alternatives. 40 C.F.R. § 230.10(a). For example, where a project is not water dependent, the Clean Water Act imposes a presumption that an alternative that would not impact wetlands is available, and requires the applicant to provide “detailed, clear, and convincing information proving that an alternative with less adverse impact is impracticable.” *Greater Yellowstone Coalition v. Flowers*, 359 F.3d 1257, 1269 (10th Cir. 2004).

As one example of avoiding impacts to wetlands, we strongly support the DEIS’s insistence on examination of alternatives to the Applicants’ proposed temporary fill haul road, DEIS Part 3.4.

However, the DEIS entirely fails to consider additional facility siting and design alternatives that would move components of the proposed facility in order to eliminate or reduce the amount of wetlands impacted. At least two other U.S. LNG export projects have demonstrated that it is possible to separate some of the infrastructure proposed for the Rio Grande terminal site. One alternative that must be considered would be to move the six liquefaction trains and associated equipment to a different and upland site, piping the already-liquefied natural gas to the terminal for loading. Other, existing LNG export facilities appear to demonstrate the feasibility of such a design. The Cove Point, Maryland project, which was constructed as an import facility more than 40 years ago, separates marine transfer facilities from gas storage and liquefaction facilities by more than a mile, connected by a pipeline that transports natural gas in liquefied

DEIS Comments of Save RGV from LNG, Shrimpers and Fisherman of the RGV, Sierra Club, and Vecinos para el Bienestar de la Comunidad Costera in CP16-454 and CP16-455 Page 54

CO9-44

Comment noted. We have revised section 3.4 of the final EIS to reflect that RG LNG originally proposed a new 1.8-mile-long temporary haul road to transport fill material from the Port Isabel dredge pile to the LNG Terminal site. RG LNG is no longer pursuing construction or use of a haul road.

CO9-45

Section 3.3.2 has been updated to describe that in order to avoid wetland impacts altogether by relocating certain Project components, the LNG facilities such as liquefaction and storage would need to be sited more than 10 miles northwest of the currently proposed location.

CO9-44

CO9-45

CO (Companies and Organizations)

CO9 - Sierra Club

form. FERC, *Environmental Assessment for the Cove Point Liquefaction Project*, Docket CP13-113, at 2 (May 2014);¹⁷¹ *see also see In the matter of Oregon LNG*, Final Order of the Lands Use Hearings Officer for the City of Warrenton, CUP14-3, VAR 14-1, CUP14-4, & VAR 14-2, at 30-31 (Mar. 6, 2016)¹⁷² (holding, in review of a liquefied natural gas export project, that liquefaction and storage facilities were not water dependent and could be located away from ship loading facilities). Here, the DEIS indicates that the majority of space at the terminal site will be occupied by the six proposed liquefaction trains, DEIS 2-4, suggesting that moving this infrastructure to a different site could significantly reduce wetland impacts. It may also be possible to similarly separate LNG storage tanks from ship loading, as in Cove Point, further reducing the water-dependent footprint.

CO9-45

Although the DEIS does not consider relocating any of the “terminal” infrastructure, the DEIS does briefly address relocating Compressor Station 3, which is proposed to be located immediately adjacent to or within the terminal site. DEIS 3-26. The DEIS arbitrarily suggests that moving this station elsewhere would not provide any environmental benefit. *Id.* The record plainly demonstrates otherwise: this compressor station, specifically, would be on wetlands (mangroves and salt flats), and moving the compressor station offsite would almost certainly reduce the acres of such wetlands impacted. *Compare* DEIS 2-5 with 4-57; *see also* DEIS 5-6. Although the DEIS asserts that there are unspecified “benefits” for “engineering purposes” associated with locating this compressor at the terminal site, the DEIS does not argue that another location would be impractical. DEIS 3-26. Nor could it: it appears that many, if not all, other LNG export facilities operate without a similar onsite pipeline compressor. The DEIS’s failure to rigorously explore alternative locations for compressor station 3 violates NEPA, and insofar as the

CO9-46

¹⁷¹ Attached as Exhibit 62 and available at <http://elibrary.ferc.gov/IDMWS/common/OpenNat.asp?fileID=13546236>.

¹⁷² Attached as Exhibit 63.

CO9-46

As stated in section 3.6 of the EIS, alternative locations for Compressor Station 3 were considered; however, no locations within the engineered parameters of operation were considered to provide an environmental advantage compared to the proposed location. Section 3.6 has been revised to also state that in order to impact zero wetlands, Compressor Station 3 would have to be located at least 10 miles from where proposed. This distance is outside of the operational design of the system.

CO (Companies and Organizations)

CO9 - Sierra Club

DEIS indicates that such an alternative would be practical, failing to adopt such an alternative would violate the Clean Water Act.

CO9-46

Even if liquefaction or other facilities are not geographically separated from ship loading, the EIS must consider an alternative that would reconfigure the site to reduce the footprint and amount of wetland impacted. Other facilities using similar liquefaction technology have been constructed on proportionally much smaller footprints. Rio Grande proposes to use “C3MR” liquefaction trains, DEIS 2-5, the same general design used at Cove Point.¹⁷³ The Cove Point facility houses one such train within a 131 acre operational footprint, with a nameplate capacity of 5.75 mtpa, requiring 22.8 acres per mtpa. *Dominion Cove Point Lng, Lp*, 148 FERC ¶ 61244, PP8-9, P276 (Sept. 29, 2014). Here, Rio Grande proposes a terminal with a 750.4 acre footprint and 27 mtpa capacity, DEIS 2-5, 2-23, or 28 acres per mtpa. Thus, Rio Grande proposes a facility design that is *prima facie* 23% less space efficient than another facility has proven feasible, whereas one would assume that efficiencies of scale would allow Rio Grande to be *more* space efficient. Similarly, the Freeport Texas LNG export facility, which also uses C3MR trains,¹⁷⁴ appears to be both more space efficient overall and to have successfully moved pretreatment infrastructure five miles away from the vessel loading site (using a design that separates pretreatment from the individual liquefaction trains and which powers liquefaction through electric motors rather than on-site gas combustion).¹⁷⁵

CO9-47

Here, the DEIS fails to consider a siting or facility design alternative that would follow the examples provided by these other facilities and reduce the footprint at terminal site, and thus the amount of wetland impacted, by either moving non-water-dependent equipment to another

¹⁷³ Exhibit 64, available at <http://www.airproducts.com/Company/news-center/2013/04/0429-air-products-wins-lng-technology-and-equipment-order-for-maryland-facility.aspx>

¹⁷⁴ Exhibit 65, available at <http://www.airproducts.com/Company/news-center/2014/09/0916-air-products-lng-technology-and-equipment-selected-for-freeport-terminal-facility.aspx>

¹⁷⁵ *Freeport LNG Development*, 148 FERC ¶ 61,076 P22 (July 30, 2014)

CO9-47

Each LNG terminal is unique in design and in resource impacts. The use and number of ground flares and a dual marine berth require more acres for development compared to other LNG terminals that are of a smaller design. The Project, as designed, takes into consideration all safety and environmental factors, not just wetlands. As stated in section 4.4.2 of the EIS, the LNG Terminal facilities were sited in a manner that would minimize impacts on wetlands; and as described in its application, RG LNG reviewed several layout alternatives to minimize impacts on wetlands. RG LNG would be required to obtain the applicable COE permits for permanent loss of wetland habitat and implement any mitigation measures required by the COE for that loss.

(upland) location, by using a more compact facility design, or both. Because other existing export facilities demonstrate that, in general, such alternatives are feasible, the DEIS's silence on this issue violates NEPA.

CO9-47

B. The DEIS Fails to Consider Alternatives Incorporating On-Site Mitigation of Wetland Impacts

Although the Applicants have not provided a wetland mitigation plan, they propose to mitigate permanent loss of wetland by preserving an unspecified amount of habitat roughly a mile away from the terminal site, at the Loma Ecological Preserve. DEIS 4-67. A reasonable alternative that must be evaluated in the EIS would be to include mitigation, in the form of wetland restoration or enhancement, at the terminal site.

CO9-48

Compensatory mitigation of wetland impacts on-site is presumptively environmentally superior to mitigation off-site, and mitigation through restoration or enhancement is presumptively superior to preservation. *See e.g.* 40 C.F.R. § 230.93(h)(2). Nonetheless, the DEIS provides no discussion of any possibility for mitigation other than the Applicant's preferred solution. NEPA requires a hard look, in the EIS, at such mitigation alternatives.

The Applicants, in their Mitigation Alternative Analysis, state that their lease of the terminal site includes 215 acres that are outside the facility perimeter and potentially ecologically suitable for restoration or enhancement.¹⁷⁶ However, the Applicants reject the possibility of such mitigation by arguing that (1) it would not be possible for the Applicants to secure an easement or other protection for on-site wetlands mitigation that lasted beyond the 50 year lease term and (2) mitigation that cannot be guaranteed to last beyond 50 years would not satisfy the Clean Water Act's requirement that compensatory mitigation be established for the "long term." 40 C.F.R. § 230.97(a)(1). Applicants have not supported either argument, and the record does not demonstrate

¹⁷⁶ FERC Accession No. 20180419-5210(32838631) at 30.

CO9-48

Since the COE has a goal of "no net loss" of wetlands in the United States, and construction of the Project, if approved, could not proceed without implementation of a COE-approved wetland mitigation plan, impacts on wetlands would be adequately mitigated. The suitability of proposed mitigation is more appropriately handled during the Section 404/Section 10 permit review process, in which applicable federal agencies (the COE and EPA) have the authority to impose requirements for compensatory mitigation. RG LNG provided a detailed Mitigation Alternatives Analysis to the COE as part of its Section 404/Section 10 permit process. Further, while the LNG Terminal may be decommissioned following its use, the BND may lease the site to another developer or otherwise manage the site such that it is not restored to wetland and open water habitat.

that on-site compensatory mitigation is so unreasonable as to be entirely excluded from the NEPA alternatives analysis.

As to Applicants' first argument, both the proposed terminal site and the site of proposed off-site mitigation are owned by the Brownsville Navigation District. The Applicants argue that the District is legally incapable of selling an easement or other instrument of perpetual protection encumbering a portion of the terminal site (although they do not provide authority for this proposition), and that the Applicants should therefore be permitted to mitigate by purchasing an easement from the District that would protect a different parcel. The Applicants offer no explanation as to why the District is incapable of selling an easement in one instance but both capable and willing to sell an easement in another.

Second, the Applicants have not demonstrated that, even if an easement encumbering the terminal site is unavailable, that compensatory mitigation could not be protected for the long term. The Applicants "do not have any foreseeable plans to expand or abandon any aspect of the Project," DEIS 2-60, notwithstanding the fact that their existing lease only encompasses a 50 year term. If the Applicants expect to renew their lease after 50 years, such a renewal would presumably also prolong protection of on-site compensatory mitigation. If the Applicants do not intend to renew their lease, or are prevented from doing so, then it may be that decommissioning of the terminal site will allow for restoration of the individually impacted wetlands, obviating (at least partially) the need for further protection of the original compensatory mitigation. The Applicants provide no discussion whatsoever of what happens when the lease expires, and as such, they have not demonstrated that the nature of the lease (together with asserted unavailability of an easement) precludes meaningful on-site mitigation.

Even if the Applicants had demonstrated that any on-site mitigation would foreseeable last

CO9-48

CO (Companies and Organizations)

CO9 - Sierra Club

only for 50 years, it is not self-evident that this would render on-site restoration or enhancement less environmentally preferable than the proposed off-site preservation. We agree that, all else being equal, protection into perpetuity is to be preferred. However, the Compensatory Mitigation Rule’s use of “long term,” rather than permanent, was deliberate. 73 Fed. Reg. at 19,646. Here, the preference for perpetual protection lies in tension with the strong preferences established by the Compensatory Mitigation Rule for on-site mitigation over off-site, and for restoration or enhancement over preservation. 40 C.F.R. § 230.93(h). Here, where preferences may point in different directions, it is the role of the EIS to take a hard look at these tradeoffs. It may be that, after careful analysis, FERC, the Corps, and other agencies decide that the potential compensatory mitigation available at this specific site is not sufficiently long term, or that uncertainty over the future of such on-site mitigation is a bigger drawback than the drawbacks of the proposed off-site preservation. But that determination must be informed by the EIS; neither the Applicants nor the DEIS have demonstrated that on-site mitigation can be excluded from NEPA review entirely.

CO9-48

C. The DEIS Does Not Take a Hard Look at Potential Mitigation and Does Not Support the Conclusion That Wetland Impacts Will Be Mitigated to Insignificance

The DEIS provides *no* specific details regarding what the proposed wetland mitigation will be: it is silent as to the amount of mitigation, the ratio at which impacts will be mitigated, which portions of the Loma Ecological Preserve the mitigation will protect, the amounts of specific wetland habitat type that will be protected, *etc.* Without this information, the DEIS fails to take the required hard look at opportunities for mitigation, and cannot support the statement that FERC expects wetlands impacts to be “reduced to less than significant levels” through mitigation. DEIS 4-67 to 4-68. Moreover, it appears that the proposal to mitigate by further protecting the Loma Ecological Preserve is fundamentally misguided, and that no such plan

CO9-49

CO9-49

We disagree. Because RG LNG would be required to obtain the applicable COE permits for permanent loss of wetland habitat and implement any mitigation measures required by the COE for that loss, any wetland impacts would be adequately mitigated, and impacts would not be significant. As described in section 4.4.2 of the EIS, wetland mitigation plans, including the determination of the mitigation ratio, are part of the permitting process associated with Section 404 of the CWA.

would meaningfully offset the Projects' wetland impacts.

CO9-49

1. The DEIS Arbitrarily Defers Discussion of Mitigation to Future Corps of Engineers Decisionmaking

The DEIS concludes, in essence, that impact to wetlands will be fully mitigated because the Army Corps of Engineers will require such mitigation as a condition of approval. DEIS 4-68. NEPA prohibits passing the buck in this manner. Indeed, one of the purposes of this EIS is to inform the Corps' evaluation of this very issue. *See infra* Part IX.A, page 84. As the Environmental Protection Agency has already explained, details regarding proposed mitigation need to be presented in a draft EIS, so that, *inter alia*, the public has a meaningful opportunity to review and comment.¹⁷⁷

CO9-50

For example, the DEIS provides no indication of the extent to which the Applicants propose to substitute one type of wetland with another, for example, by compensating for loss of mangroves (estuarine scrub-shrub) with preservation of low marsh (estuarine emergent wetland). Commenters contend that in general, such substitution is inappropriate, and in some cases loss of one wetland type cannot be compensated through protection of another, no matter the mitigation ratio used.

The DEIS similarly provides no indication of the proposed amount of compensatory mitigation or ratio. Although compensatory mitigation is inherently imperfect and therefore always requires a greater than 1:1 ratio, here, the ratio should be at least an order of magnitude higher. What Applicants propose here, permittee-responsible mitigation using a preservation only approach (*cf.* restoration, establishment, or enhancement) is the least favored method of mitigation, and therefore requires a higher ratio. 40 C.F.R. § 230.93(b)(2)-(4), (h)(2); *see also* 73

¹⁷⁷ See EPA, Comments to FERC submitted FERC Accession No. 20161115-5024; available at <https://elibrary.ferc.gov/IDMWS/common/opennat.asp?fileID=14398392> (hereinafter "EPA Comment"). The undersigned adopt these comments in full and incorporate them by reference.

CO9-50

We disagree. As described in section 4.4.2 of the EIS, wetland mitigation plans, including the determination of the mitigation ratio, are part of the permitting process associated with Section 404 of the CWA. Because RG LNG would be required to obtain the applicable COE permits for permanent loss of wetland habitat and implement any mitigation measures required by the COE for that loss, any wetland impacts would be adequately mitigated and impacts would not be significant. Any requirements for mitigation resulting from temporal delays in restoration (such as along the Pipeline System) would also be addressed in the CWA Section 404 permitting process (see section 4.4.2.2). Regarding the restoration of wetlands disturbed during construction, section 6.3 of RG Developers' Procedures describes wetland restoration requirements, which includes, but is not limited to, consultation with appropriate federal or state agencies to develop a Project-specific wetland restoration plan and ensuring that all disturbed areas successfully revegetate with wetland herbaceous and/or woody plant species and control the invasion and spread of invasive species and noxious weeds. Section 6.4.5 of RG Developers' Procedures describes the criteria for determining successful wetland restoration. The COE may require additional monitoring parameters during its permitting process.

Fed. Reg. at 19,604, 19,613, 19,624. The ratio must be further increased because of the temporal difference between when impacts will occur (anticipated start of construction) and the earliest date at which the proposed preservation will have an impact (2023, because the Loma Ecological Preserve is already protected until then). 40 C.F.R. § 230.93(m), accord 73 Fed. Reg. at 19,610.

Nor does the DEIS specify which impacts the Applicants propose to mitigate. As we explain above, in addition to the wetlands permanently occupied and eliminated by the project, many of the wetlands impacted by construction will be restored only after a significant delay, and even then only imperfectly. The DEIS does not address whether these impacts will be mitigated, and if not, why the unmitigated impacts should be deemed insignificant.

2. The Proposal to Mitigate Wetlands Impacts by Preserving Portions of the Loma Ecological Preserve Is Conceptually Flawed

Separately, nothing in the DEIS supports the notion that “preserving” the Loma Ecological Preserve would meaningfully mitigate the Projects’ adverse wetlands impacts.

First, preservation only provides meaningful mitigation if the area “preserved” would otherwise be threatened. There is no evidence of such a threat here. The area is owned by the Brownsville Navigation District and leased to the U.S. Fish and Wildlife Service through 2023, and therefore plainly already protected through that time. Applicants provide no evidence showing that the area will become threatened once this lease expires. To the contrary, the Applicants themselves acknowledge that there are no specific developments planned that would threaten the Preserve. Mitigation Alternatives Analysis at 68. At most, Applicants state that it is “likely” that some future project would “look to” “possible” development at the site. *Id.* But it is also possible that the Fish and Wildlife Service will choose to seek to extend its lease in light of the habitat value of these lands (especially the value of non-aquatic habitat). Mitigation Alternatives Analysis at 74. Applicants speculate that the Brownsville Navigation District might

DEIS Comments of Save RGV from LNG, Shrimpers and Fisherman of the RGV, Sierra Club, and Vecinos para el Bienestar de la Comunidad Costera in CP16-454 and CP16-455 Page 61

CO9-50

CO9-51

CO9-51

As described in section 4.4.2 of the EIS, wetland mitigation plans are part of the permitting process associated with Section 404 of the CWA. The details of any conservation easement or the timeframe for protection of wetlands are more appropriately handled during the Section 404/Section 10 permit review process, in which applicable federal agencies (the COE and EPA) have the authority to impose requirements for compensatory mitigation, including the demonstration of an unmitigated risk to wetlands proposed for preservation. FERC does not have authority over any lease agreement that the BND may enter with the FWS or RG Developers regarding the Loma Ecological Preserve. We agree with the comment that RG LNG must mitigate for Project-related wetland impacts and that, while wetland mitigation may also serve to benefit special status species, such benefits would not replace the need to mitigate for wetland impacts. RG LNG’s final wetland mitigation plans would be developed and submitted to the COE, and would be implemented in addition to the construction mitigation measures outlined in RG LNG’s Procedures and the measures described in the EIS. Construction of the LNG Terminal would not commence prior to finalization of the wetland mitigation plans and issuance of the COE’s CWA Section 404/Section 10 permit.

choose not to extend this lease, but offer no explanation as to why the District would find sale of an easement preferable to extension of the lease. Mitigation Alternatives Analysis at 74.

Alternatively, even the Fish and Wildlife Service lease is not renewed, limits imposed by the Endangered Species Act and other laws may nonetheless protect the area from future development. As EPA explained, “Rio Grande LNG has not demonstrated that the Loma Ecological Preserve is under threat of future development, and they certainly have not quantitatively estimated that threat.” EPA Comment at 8; *see* 40 C.F.R. § 230.93(h)(1)(iv) (preservation only provides compensatory mitigation where the resources to be preserved are “under threat of destruction or adverse modifications.”). Insofar as this area is already preserved, further “preservation” of it provides little if any environmental benefit, and cannot serve to mitigate the Projects’ wetland impacts.

Second, even if the Applicants could offer non-redundant protection of the Preserve, this may not offset *wetlands* impacts. The goal of mitigating wetlands impacts is to offset harm to the services and functions performed by the impacted wetlands. 40 C.F.R. §§ 230.93(e), (f). Applicants argue that the Loma Ecological Preserve provides habitat “for a wide variety of wildlife,” emphasizing ocelots, Aplomado falcons, and piping plover. Mitigation Alternatives Analysis at 68. As EPA recognized in its November 2016 comments, while preservation of habitat for terrestrial species is a laudable goal, “the value of the proposed preservation to non-aquatic threatened and endangered species can[not] be the basis for the argument to accept the proposal of compensatory mitigation for unavoidable impacts to aquatic habitats. The value of the proposed mitigation for unavoidable impacts to aquatic resources should be demonstrated *first based on its value to aquatic resources.*” EPA Comment at 8 (emphasis added). Neither the material submitted

CO9-51

by the Applicants nor the DEIS meaningfully attempt to make such a demonstration.¹⁷⁸ The Applicants cite benefits to non-aquatic species, and argue that since preservation within the Loma Ecology Preserve was accepted as mitigation for the much smaller SpaceX project, this must demonstrate satisfaction of section 230.93(h)(1)(i) and (ii). Mitigation Alternatives Analysis at 68, 71-72. The SpaceX project permanently impacted 6.19 acres of wetland (including direct and indirect effects), only 3.9 of which were compensated with offsite preservation¹⁷⁹ whereas the Terminal here will destroy 182.4 acres of wetlands; as such, the two projects are hardly comparable, and the Corps' acceptance of preservation there does not establish precedent applicable here. Commenters further share EPA's opinion that even for the smaller SpaceX project, preservation was an inappropriate form of mitigation.

CO9-51

VI. The DEIS Fails to Adequately Consider Reliability and Safety

A. The Public Risk Impacts Analysis Related to the SpaceX Launch Facility Is Flawed

1. The DEIS Discounts and Fails To Adequately Disclose the Risks Associated With the Nearby SpaceX Launch Facility

The DEIS recognizes potential impacts to and from the Projects and the nearby SpaceX Commercial Spaceport Project, which is located approximately 5.4 miles southeast of the proposed Terminal and anticipates rocket launches starting as soon as this year. DEIS 4-337. During its review, FERC staff concluded that there would be debris above a threshold of 3e-5 years, the failure rate level used to evaluate the potential for cascading damage and the failure rate

¹⁷⁸ Moreover, as discussed above in Sections IV.B.1. & IV.C., the DEIS provides no evidence that the acreage to be protected within the Preserve even contains suitable habitat for these terrestrial species—the ocelot, in particular.

¹⁷⁹ SpaceX Final EIS at 4-45, 6-4, and Appendix M, attached as Exhibit 66, available at <https://cdxnodengn.epa.gov/cdx-enepa-II/public/action/eis/details/downloadEisDocuments?eisId=88519>.

CO (Companies and Organizations)

CO9 - Sierra Club

used by FAA in space launch failure prior to 2017,¹⁸⁰ but that the cascading damage at the terminal site would not impact the public. *Id.* FERC staff concluded that rocket launch failures could impact onsite construction workers and plant personnel. *Id.* The DEIS also states that the Coast Guard would determine any mitigation measures needed on a case-by-case basis to safeguard public health and welfare from LNG carrier operations during rocket launch activity.

The discussion of the unique risks posed by the SpaceX launch site on Rio Grande's LNG Terminal, and the cumulative risks posed to the public as a result of this launch site on the three currently proposed LNG terminals along the Brownsville Ship Channel, is grossly inadequate. The DEIS includes a mere two paragraphs discussing potential impacts from the SpaceX launch facility; does not reference, discuss, or incorporate the March 2017 ACTA Technical Report entitled "Rio Grande LNG Facility Hazard Predictions Due to Launch Vehicle Failures at the SpaceX Boca Chica Texas Spaceport" or any other SpaceX-related impacts analyses; and includes only a single 2014 SpaceX article as a referenced article in Appendix Q. As part of the impact analysis, Rio Grande LNG must quantify risk from future space launch missions in accordance with 14 C.F.R. Parts 415 and 417. But no data is provided to demonstrate whether the public risk criteria in 14 C.F.R. § 417(b) is met for the total risk to the public (1e-4 cumulative), for any individual member of the public (1e-6 per launch), for water borne vessel (1e-5), or for aircrafts (1e-6). Given the fact that FERC staff concluded debris would occur above a regulatory threshold, the lack of further analysis or disclosure in the DEIS fails to satisfy the need to inform the public about serious impact risks.

¹⁸⁰ 14 C.F.R. 417.107(b) was updated from 3e-5 casualties for three different events (in the 2016 edition) to 1e-4 casualties cumulative (in the 2017 edition). It is unclear why the 2016 regulation was applied to the DEIS.

CO9-52

See response to Comment Letter IND67. The impact probabilities from a failed rocket launch are dependent on fragment velocity, mass, shape and size. The initial ACTA report provided impact probability contours for a single fragment size. In response to FERC staff's information request, additional risk contours (results of the analysis) were provided for fragments with kinetic energy thresholds of 11, 100, 1,000, 10,000, 100,000, and 1,000,000 foot-pounds. The risk contours are submitted as public information on the Project's docket on March 21, 2017 and August 22, 2017. The kinetic energies relate to the potential for them to cause damage, including potential adverse impacts to people and potential damage to piping, pressure vessels, and reinforced concrete of a varying thicknesses. This information was used to assess the potential direct impact to persons onsite (i.e., construction workers and permanent plant personnel) and potential for cascading effects that could lead to releases. For any releases that could be triggered, hazard modeling was evaluated under varying conditions to determine whether there could be impacts offsite that could impact the public. The analyses indicated there would not be any significant risk to the offsite public. Specific information on what potential projectiles could result in damage and releases is considered as potential information that adversaries could use and therefore was categorized as Critical Energy Infrastructure Information (CEII) and would not be subject to public disclosure.

CO9-52

2. FERC Must Clarify the Basis for Its Potential Impacts Analysis and Its Discrepancy with ACTA's Conclusions

FERC concluded that there would be debris above the threshold failure rate level used to evaluate the potential for cascading damage (*i.e.*, 3e-5 per year) but concluded that the cascading damage at the Terminal would not impact the public. DEIS 4-337. However, Rio Grande LNG hired a consultant, ACTA, to provide information to FERC, and ACTA's report concluded that the probability of debris impacting the Terminal boundary and the Brownsville Shipping Channel was less than the FAA risk criteria in 14 C.F.R. Part 417.¹⁸¹ Based on this conclusion, RG Developers stated that no additional action was required from the company in response to FERC's siting concerns.¹⁸² The subsequent Environmental Information Request and responses did not appear to change ACTA or RG Developers' conclusion on this issue.¹⁸³

We request that FERC clarify the basis for its conclusion and explain any discrepancies between its independent review of possible impacts and that of ACTA/RG Developers. We further request that FERC publicly disclose any correspondence or written review of ACTA's report that explain the bases for FERC's conclusions and are not already publicly available on the docket.

3. The Risk Assessment for Space Launch Failures Improperly Failed To Include the BFR

A rocket launch failure impact analysis must include all launch vehicles that meet the threshold criteria for realness and relevance. Under NEPA, a rocket launch failure impact analysis should include review of all vehicles that could reasonably be foreseen to be launched at a site during the site's lifespan.

¹⁸¹ FERC Docket CP16-454, Accession No. 20170321-5137 at 4-5.

¹⁸² *See id.* at 5.

¹⁸³ FERC Docket CP16-454, Accession No. 20170802-3006 (EIR); Accession No. 20170822-5093 (Response from RG Developers).

CO9-53 See the responses to comment CO9-52.

CO9-54 See response to Comment Letter IND67.

CO9-53

CO9-54

In its response to a FERC Environmental Information Request, Rio Grande LNG stated that its contractor ACTA excluded the Interplanetary Transport System (ITS) and any other launch vehicles because SpaceX had not proposed to launch any other existing or planned launch vehicles from the Boca Chica Spaceport as of March 21, 2017.¹⁸⁴ The response also called into question whether ITS, the Big Falcon Rocket (BFR) / Big Falcon Spaceship (BFS), or other vehicles were viable or sufficiently real for purposes of the analysis required for the Terminal.

However, announcements by SpaceX representatives over the past 20 months make clear that the BFR¹⁸⁵ is sufficiently real and relevant for purposes of impacts analysis for the three proposed Brownsville LNG terminals. For example:

CO9-54

- CEO Elon Musk has stated that SpaceX is “no longer planning to upgrade Falcon 9 second stage for reusability” because the company is “[a]ccelerating BFR instead.”¹⁸⁶
- At the 2017 International Astronautical Federation conference, Musk stated that SpaceX is aiming to conduct two uncrewed missions to Mars by 2022 and a crewed mission around the moon and back in 2023.
- Following this conference, a series of public comments have made clear that the Boca Chica rocket facility will be almost exclusively dedicated to testing BFR’s spaceship prototypes.¹⁸⁷
- CEO Musk stated that spaceship hop testing would “most likely . . . happen at our Brownsville location,” perhaps as early as 2019.¹⁸⁸ SpaceX President/COO Gwynne Shotwell has stated that she believed BFR could begin its first orbital test missions as early as 2020.¹⁸⁹

¹⁸⁴ FERC Docket CP16-454, Accession No. 20170321-5137 at 5.

¹⁸⁵ CEO Elon Musk has stated that the BFR will be called the “Starship,” and the first stage will be named the “Super Heavy,” but we will refer to the rocket as BFR in these comments.

¹⁸⁶ Elon Musk, <https://twitter.com/elonmusk/status/1063865779156729857> (Nov. 17, 2018), attached as Exhibit 67.

¹⁸⁷ See Teslarati, “SpaceX Mars rocket test site receives first huge rocket propellant storage tank” (July 12, 2018), attached as Exhibit 68.

¹⁸⁸ *Id.*

¹⁸⁹ *Id.*

- In January 2018, at the TAMEST Annual Conference, Shotwell stated that the Boca Chica facility would be used for “early vehicle testing” and then would move from a “test site to a launch site.”¹⁹⁰
- In July of this year, SpaceX delivered a 100,000-gallon liquid oxygen tank to its prospective Boca Chica test and launch facility. In a statement provided to the *Valley Morning Star*, SpaceX spokesperson Sean Pitt confirmed that the tank had been delivered to Boca Chica as part of an ongoing effort to ready the site for testing and launches of an unspecified “vehicle.”¹⁹¹
- SpaceX has recently filed for permits and licenses that will eventually allow the company to legally conduct hop and flight tests of a BFR spaceship prototype at the Boca Chica site.¹⁹² These applications are not public, but FCC’s Experimental Licensing System has published a summary of the SpaceX request to test these vehicles in the near future.
- In September 2018, Musk announced that the spacecraft will be 387 feet tall (118 meters), SpaceX’s largest rocket to date. This is 157 feet taller than the Falcon Heavy and twice as powerful.¹⁹³ This announcement also included a series of design images. The BFR’s booster will be lifted by 31 Raptor engines that produce a thrust of approximately 5,400 tons.¹⁹⁴ Musk stated that there would not be many big changes to the booster going forward.¹⁹⁵

CO9-54

This available information paints a reasonably clear picture: SpaceX is prioritizing the development and testing of the BFR; the BFR is significantly bigger and more powerful than the Falcon boosters; and SpaceX is moving forward to test (and most believe launch)¹⁹⁶ the BFR at the Boca Chica site. It is reasonable to conclude that BFR may, and likely will, be launched from the Boca Chica site during the Rio Grande LNG’s minimum 20-year life (which could be extended to a 50-year life).

¹⁹⁰Gwynne Shotwell, TAMEST 2018 Annual Conference: Aerospace, https://www.youtube.com/watch?time_continue=303&v=kjTHJzWPTnU.

¹⁹¹ See Teslarati, “SpaceX Mars rocket test site receives first huge rocket propellant storage tank” (July 12, 2018), attached as Exhibit 68.

¹⁹² Teslarati, “SpaceX seeks licenses for BFR spaceship prototype hop test campaign” (Nov. 22, 2018), attached as Exhibit 69.

¹⁹³ See <https://www.spacex.com/mars> (describing height and rocket capability); Exhibit 70 (SpaceX, “Making Life Multiplanetary” (2017)).

¹⁹⁴ Exhibit 70 (SpaceX, “Making Life Multiplanetary (Transcript)” (2017)).

¹⁹⁵ Space.com, “The New BFR” (Sept. 21, 2018), attached as Exhibit 71 and available at <https://www.space.com/41901-spacex-bfr-mars-spaceship-rocket-design-changes.html>.

¹⁹⁶ See generally Nasa Spaceflight, “Where will BFR launch from first?”, attached as Exhibit 72 and available at <https://forum.nasaspaceflight.com/index.php?topic=44168.0>.

Under NEPA’s reasonably foreseeable standard approach, an analysis of potential impacts to the Rio Grande LNG Terminal should include potential impacts from the BFR due to the spaceship’s realness and relevance. FERC should coordinate with the FAA and an independent third-party contractor to get the latest information available regarding the BFR and should undertake a quantitative risk analysis in accordance with 14 CFR Parts 415 and 417. This is particularly true in light of FERC’s conclusion that the much smaller and less powerful Falcon vehicles could cause debris above the regulatory threshold at the Rio Grande LNG Terminal site.

CO9-54

4. The DEIS Provides Insufficient Information Regarding Debris Impacts to the Brownsville Ship Channel

The DEIS states that the Coast Guard would determine any mitigation measures needed on a case-by-case basis to safeguard the public health and welfare from LNG carrier operations during rocket launch activity. DEIS 4-337. No further information is provided regarding potential impacts to the Brownsville Ship Channel (BSC) or the public as a result of these activities.

The SpaceX facility is closer to the BSC than to the Terminal site. If debris is expected at the Terminal site (and to the onsite workers and plant personnel), debris may impact LNG carrier operations and pose a risk to the public safety. No quantification of this risk is provided in the DEIS in accordance with 14 C.F.R. § 417.107(b)(3) or otherwise. No proposed mitigation is provided to reduce this risk and no assurance is given that the Coast Guard will require Rio Grande LNG to otherwise mitigate these risks.

CO9-55

By letter dated December 26, 2017, the United States Coast Guard issued its Letter of Recommendation pursuant to 33 C.F.R. 127.009 concluding that the BSC be considered suitable for LNG marine traffic.¹⁹⁷ The Coast Guard reviewed the Waterway Suitability Assessment for the Rio Grande LNG Project that was submitted by Acutech on December 27, 2015.

¹⁹⁷ FERC Docket CP16-454, Accession No. 20180118-3038.

CO9-55

Public portions of the ACTA analysis has been filed on the Project's docket on March 21, 2017 with subsequent data request responses and updates filed on August 22, 2017 and September 7, 2017. In addition, the failed rocket launch analysis considered LNG carrier operations within the BSC. As stated in section 4.12.1.6, the Coast Guard would determine any mitigation measures needed on a case by case basis to safeguard public health and welfare from LNG carrier operations during rocket launch activity.

It is unclear if this review included information provided subsequent to Acutech's Letter of Intent, including ACTA's analysis of impacts from SpaceX. However, the Letter of Recommendation's Analysis did include a short description of the SpaceX launch site. This analysis concluded that based on FERC assumptions, FERC staff "found that the risk of public impact from a projectile in the 10,000 to 100,000 ft-lb range would be just inside the tolerable region (i.e., within the [As Low As Reasonably Practicable] region) after accounting for 10% probability factor for wind."¹⁹⁸

CO9-55

FERC should confirm that its staff provided the most recent information available to the Coast Guard during its review of the Waterway Suitability Assessment. FERC should also clarify the failure probability and public risk to LNG carrier operations during rocket launches, as well as any proposed mitigation and assurances provided by Rio Grande LNG to reduce these risks.

B. The DEIS' Reliability and Safety Analysis Is Incomplete and Fails to Account for All Reasonably Foreseeable Infrastructure

LNG facilities handle flammable and sometimes toxic materials that can pose a significant risk to the general public. In fact, a number of incidents, some of which are described in the DEIS, have occurred involving LNG carrier accidents or U.S. LNG facilities. *See* DEIS 4-297 – 299; 4-307 – 309. Most recently, in 2014, an explosion at the Plymouth LNG facility caused the failure of pressurized equipment, resulting in high velocity projectiles. Members of the scientific community have criticized LNG terminal safe-siting policy as faulty,¹⁹⁹ and we incorporate those concerns in these comments.

¹⁹⁸ *Id.* at 8.

¹⁹⁹ *See, e.g.*, Havens, Jerry & James Venart, "United States LNG Terminal Safe-Siting Policy is Faulty," FERC 20150114-5038, attached as Exhibit 73.

1. The DEIS Should Not Be Issued Until the DOT Issued Its Letter of Determination

The DEIS fails to adequately analyze and disclose potential reliability and safety information for the Rio Grande LNG Terminal site. As the DEIS notes, on August 31, 2018, the DOT and FERC signed an MOU regarding coordination and responsibility throughout the LNG permit application process for FERC-jurisdictional LNG facilities.²⁰⁰ In the MOU, the DOT agreed to issue a Letter of Determination (LOD) stating whether a proposed LNG facility would be capable of complying with location criteria and design standards contained in Subpart B of Part 193. FERC also committed to rely upon the DOT determination in conducting its review of whether the facilities would be in the public interest, although the issuance of an LOD does not abrogate responsibility over continued compliance with Part 193. The MOU was effective upon signing by the agencies.

As the DEIS acknowledges, a LOD has not been issued by the DOT for the Rio Grande LNG Project because the DOT has not completed its analysis of whether the proposed facilities would meet the DOT's siting standards. DEIS 4-297. The latest filings in the FERC docket shows that the U.S. Pipeline and Hazardous Materials Safety Administration requested information related to its evaluation of compliance with the siting requirements on August 14, 2018.²⁰¹

The public should have the opportunity to review the most recent Design Spill Package documentation, final Hazard Analysis Report(s), all up-to-date supplemental documentation related to compliance with the Subpart B regulations, any correspondence between the DOT and the applicant, and the LOD itself prior to the issuance of a decision. These are materials and necessary authorizations that should be included in the DEIS. FERC staff should undertake their

²⁰⁰ "Memoranda of Understanding (MOU), Federal Energy Regulatory Commission, accessed November 26, 2018, attached as Exhibit 74 and available at <https://www.ferc.gov/legal/mou/2018/FERC-PHMSA-MOU.pdf>.

²⁰¹ FERC Docket CP16-454, Accession No. 20180821-5041.

CO9-56

The August 2018 MOU between DOT PHMSA and FERC does not require DOT PHMSA's LOD to be issued prior to the draft EIS. RG LNG has filed in the Project docket numerous filings in response to DOT PHMSA information requests. Certain information is filed as public information and is available for the public to review. As discussed in Section 4.12.1.2, DOT PHMSA has issued its LOD for the Project. In addition, as indicated in Section 4.12.1.6 of the EIS, FERC conducted an engineering review on the use of various layers of protection or safeguards to reduce risks of potential hazards to offsite public. FERC also reviewed potential impacts from natural hazards and external impacts from the surrounding areas. This review focuses on the safe and reliable operation of the site.

CO9-56

responsibilities in accordance with the 2018 MOU and issue a complete DEIS (or supplemental document) upon receipt of the LOD.

CO9-56

2. The Safety Analysis Fails To Adequately Describe Potential Impacts from Collocated Pipelines on the Rio Grande LNG Terminal Site

FERC states that it reviewed whether any pipeline operations would be associated with the Project and whether any existing pipelines would be located near the site. DEIS 4-338. This information was used to evaluate whether the Project and any associated pipeline operations could increase the risk to the pipeline facilities and the public and whether any existing pipeline operations could increase the risk to the Terminal site and the public. Additionally, all pipelines associated with the Project must meet the DOT regulations under 49 CFR 192. *Id.*

In the DEIS, FERC states that it identified Enbridge’s Valley Crossing Pipeline (VCP), which is currently under construction, as routed through the Project site’s utility easement. If the Rio Grande LNG Project is approved, the Project’s facilities would be within the Potential “Impact Radius (PIR) with portions within 660 feet from the VCP. FERC also evaluated the potential risk of incidents from the pipeline, concluding that a rupture, though unlikely, would have similar impact distances to structures as the PIR and could cause cascading damage to the Terminal. DEIS 4-340 – 341.

However, the DEIS does not include any discussion of the pipeline associated with the proposed Texas LNG Project. The currently out-for-comment DEIS for the Texas LNG Project states that a 10.2-mile-long, 30-inch-diameter pipeline will deliver natural gas to the project. Texas LNG Project (CP16-116-000) DEIS 1-16. Diagrams provided in Appendix H to the DEIS suggest that this pipeline will also be routed through (or very near to) the Rio Grande LNG Project site’s utility easement. Texas LNG Project DEIS, App. H. The Texas LNG Project is also under FERC’s jurisdiction and its pipeline, while considered non-jurisdictional in the DEIS, is

CO9-57

DEIS Comments of Save RGV from LNG, Shrimpers and Fisherman of the RGV, Sierra Club, and Vecinos para el Bienestar de la Comunidad Costera in CP16-454 and CP16-455 Page 71

CO9-57

The pipeline associated with the Texas LNG project is included in the cumulative analysis in section 4.13 and specifically is identified as the Intrastate Pipeline for Texas LNG in the analysis. Per the project description for the pipeline in section 4.13.1.3, Texas LNG construction would likely begin in 2020, if approved, and would last about 1 year; therefore, depending on the timing of RG Developers receipt of certifications, authorizations, and necessary permits, the construction of the two project could be concurrent. This assumption is applied in our cumulative analysis to evaluate a worst case scenario. As the commentor points out, more detailed information about the pipeline, including mapping of its location, are appropriately available in the draft EIS for the Texas LNG Project. In addition, section 4.12.1.6 of the final EIS has been updated to include the Intrastate Pipeline for Texas LNG.

clearly reasonably foreseeable and should be included in FERC's review of the Rio Grande LNG Terminal.

Specifically, we request that the DEIS be updated with information related to this planned pipeline, including, but not limited to: a plot plan showing the currently proposed location of the pipeline associated with the Texas LNG Project; approximate dates by which the pipeline will be constructed through or near to the Rio Grande LNG terminal site; the piping specification, pipe diameter, design pressure, operating pressure, buried depth, and class location of the pipeline; any potential consequence to the Rio Grande LNG terminal that would result from pipeline failure; how Rio Grande LNG will prevent damage to the buried pipeline, assuming the pipeline is constructed prior to the Terminal facilities; any description of potential relocation of the RB pipelines due to the Texas LNG associated pipeline; any correspondence between RB and any pipeline company related to the collocation of the RB pipelines and any other not-already-disclosed pipelines; and any correspondence with federal, state, or local agencies about collocation of these pipelines. We also request that FERC consult with DOT staff regarding the PIR for the pipeline that will supply natural gas to the Texas LNG Project and additional data necessary to quantify risks associated with pipeline ruptures or leaks. This information should be disclosed to the public for comment prior to the issuance of any decision for the Rio Grande LNG Project.

CO9-57

3. The DEIS Fails to Demonstrate That Rio Grande LNG Will Exercise Sufficient Legal Control Over Activities at the Terminal Site

The requirements in 49 C.F.R. Part 193 state that an operator must exercise legal control over the activities within the exclusion zone as long as the facility is in operation. *See* 49 C.F.R. 193.2007. The LOD is still outstanding, but any subsequent NEPA document must clarify how Rio Grande LNG meets this requirement and must specifically address how it meets this

CO9-58

CO9-58

See response to comment CO9-56.

requirement for collocated pipelines and all other facilities on the Terminal site. To the extent that Rio Grande LNG exercises legal control over facilities that do not belong to it, please clarify the terms of utility access for purposes of complying with applicable safety rules.

CO9-58

VII. The DEIS Fails to Adequately Consider Air Pollution and Associated Impacts

RG LNG, if allowed to be built, would be *the largest single source of air pollution in the Rio Grande Valley* for VOCs, CO, NOx, PM 2.5, and SOx.²⁰² This is in addition to two other proposed LNG terminals proposed for the Brownsville Ship Channel. This significant source of air pollution and the resulting health and environmental impacts for this region must be adequately evaluated and mitigated by FERC.

A. Construction Air Quality Impacts

FERC determines that the concurrent construction and start-up operations of RG LNG “could result in exceedances of the NAAQS in the immediate vicinity of the LNG Terminal during these construction years,” but then concludes *without additional justification or analysis* that “these exceedances would not be persistent at any one time during these years due to the dynamic and fluctuating nature of construction activities within a day, week, or month. Therefore, these concurrent emissions would not have a long-term, permanent effect on air quality in the area.”²⁰³ (emphasis added). FERC’s conclusions about the fluctuating nature of the air quality impacts from the construction phase are not supported by any analysis demonstrating the impacts on health, particularly in light of the demographics of the nearby populations.

CO9-59

As discussed in Section III.B.3 above, the “immediate vicinity” of the LNG Terminal includes low-income, minority populations that face barriers to accessing adequate health care and

²⁰² RG LNG application to TCEQ, dated 11/30/16; EPA & TCEQ 2014 point source inventories.

²⁰³ DEIS 4-259-260.

CO9-59

We disagree. The construction air emissions presented in section 4.11.1.3 of the EIS are represented in total annual tons of pollutants. However, these emissions would occur over the course of the 78-month-long construction period, and, as operation of equipment, land disturbance, and other construction activities would be conducted intermittently and as needed to complete each stage of Project construction, emissions would vary throughout the year. Therefore, as stated in the EIS, the construction emissions’ impact on ambient air quality would vary with time due to the construction schedule, the mobility of the sources, and the variety of emission sources. Further, construction emissions would be highly localized. Section 4.11.1.3 of the final EIS was revised to clarify that the nearest residential areas are located about 2.2 miles from the LNG Terminal site. Because pollutant concentrations would decrease with distance from the LNG Terminal site, concurrent emissions would be unlikely to exceed the NAAQS in residential areas.

CO (Companies and Organizations)

CO9 - Sierra Club

are at higher risk of health impacts. The DEIS does not analyze the harms of these NAAQS exceedances during construction years on nearby sensitive and environmental justice populations, and has not taken the requisite hard look into the air quality impacts during the construction phase.

CO9-59

B. Operational Air Quality Impacts

The DEIS concludes that “operation of the LNG Terminal would not cause, or significantly contribute to, an exceedance of the NAAQS.”²⁰⁴ However, the modeling of air quality impacts from the Terminal as part of the application for the PSD air permit, which the DEIS relies on, is flawed and relies on unsubstantiated assumptions, such as: 1) the sulfur content of the incoming gas stream is uncertain, which could result in the underestimation of emissions; 2) emissions of particulate matter from flares and thermal oxidizers are underestimated; and 3) flare emissions resulting from LNG tanker vessel loading operations are underestimated.²⁰⁵

CO9-60

Furthermore, the DEIS incorrectly assumes that RG LNG properly completed a BACT assessment for the LNG Terminal.²⁰⁶ As noted in the attached TCEQ air permit comments,²⁰⁷ however, the current permit proposed by TCEQ for the Applicant does not require BACT because it relies on an incomplete review of existing control technologies sources, particularly for gas turbines, thermal oxidizers, flares, and fugitive emissions. This insufficient BACT review would lead to higher emissions from the facility than the best available control technologies currently in use elsewhere in the world. FERC should evaluate these incorrect assumptions and the resulting air quality impacts in the DEIS, and consider the proper BACT technologies proposed in the attached TCEQ air permit comments as alternatives in the DEIS.

²⁰⁴ DEIS 4-260.

²⁰⁵ See Comments filed to TCEQ on RG LNG’s Draft Air Quality Permit, dated March 26, 2018 (explaining these issues with the air quality analysis), attached as Exhibit 75 and incorporated by reference herein.

²⁰⁶ DEIS 4-243.

²⁰⁷ Exhibit 75

CO9-60

The comment pertains to the TCEQ’s review and enforcement of air quality permits for the Project, which is not under FERC’s jurisdiction. RG Developers conducted a PSD Screening Analysis, NAAQS Analysis, and PSD Increment Analysis for stationary sources at the LNG Terminal and Compressor Station 3 in accordance with the TCEQ’s permitting requirements, and on December 17, 2018, the TCEQ issued an order granting air quality permits to RG LNG. Further, mitigation and emission reductions are more appropriately handled by the federal and state agencies, in this case the EPA and TCEQ, with the authority to impose such reductions to meet federal and state air quality goals.

VIII. The DEIS Fails to Adequately Address Climate Change

The DEIS fails to take the required hard look at greenhouse gas emissions and climate change for multiple reasons.

First, the DEIS fails to even acknowledge the Projects' cumulative operational greenhouse gas emissions. The DEIS separately presents these emissions on three different tables (the latter two including separate values that are not aggregated). DEIS 4-253, 4-265, 4-267. Because the impacts of greenhouse gas emissions occur only cumulatively, there is no reason to segregate these emission estimates—indeed, in doing so, the DEIS is arbitrary and capricious, and its failure to present the total emission estimate keeps both decisionmakers and the public in the dark as to the Projects' true impacts. It appears that the total operational emissions identified in the DEIS amount to nearly 10 million tons per year of carbon dioxide equivalent (CO₂e), specifically, 9,998,876 tons.

Second, the figures provided in the DEIS underestimate emissions by using outdated estimates of the potency of greenhouse gases (GHGs) other than carbon dioxide. The DEIS addresses these other GHGs by converting them to CO₂e. DEIS 4-235. However, the conversion factor (global warming potential or GWP) used for methane, the predominant non-carbon-dioxide greenhouse gas at issue here, is sorely outdated, and fails to account for short- and medium-term impacts. The DEIS uses a GWP value of 25 for methane. *Id.* Although the DEIS provides no explanation for either the source of this number or FERC's reason for choosing it, the figure corresponds with the value presented by the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report in 2007 to reflect the impact of methane on a hundred-year timescale. In September 2013, five years *before* publication of the DEIS, IPCC released its Fifth Assessment Report, which includes superseding and significantly higher estimates for the GWP of methane.

DEIS Comments of Save RGV from LNG, Shrimpers and Fisherman of the RGV, Sierra Club, and Vecinos para el Bienestar de la Comunidad Costera in CP16-454 and CP16-455 Page 75

CO9-61

CO9-62

CO9-61

We disagree. Annual emissions of GHGs are disclosed in the EIS for each Project component, as indicated in the comment. This is consistent with the requirements RG Developers would be required to adhere to for Project GHG emissions reporting under EPA's Mandatory GHG Reporting Rule.

CO9-62

The global warming potential (GWP) factor and timeframe (25 over 100 years) used in the EIS is the same used by the EPA for permitting and regulatory purposes, which RG Developers would be required to adhere to for Project GHG emissions reporting (see 40 Code of Federal Regulations [CFR] 98). The EPA has accepted the GWP value of 25 for methane over a 100-year period. FERC appropriately selected this value because this is the value EPA established on November 29, 2013, for reporting of GHG emissions. The EPA supported the 100-year time period over the 20-year period in its summary of comments and responses in the final rulemaking, 2013 Revisions to the Greenhouse Gas Reporting Rule and Final Confidentiality Determinations for New or Substantially Revised Data Elements, establishing the methane GWP at 25 (78 FR 71904, November 29, 2013). Similarly, in this final rulemaking, EPA supported the adoption of the published Intergovernmental Panel on Climate Change's Fourth Assessment Report GWP values over the Fifth Assessment Report values. The EPA acknowledged the Fifth Assessment Report could lead to more accurate assessments of climate impacts in the future; however, when balanced with the benefit of retaining consistency with other U.S. climate programs, including EPA's Greenhouse Gas Reporting Program and Inventory of U.S. Greenhouse Gas Emissions and Sinks, the potential gain in accuracy does not justify the loss of consistency in reporting and likely would cause stakeholder confusion among the various GWPs used in different programs. The EPA identified that it may consider adoption of the Fifth Assessment Report GWPs in the future, at which time we will ensure that FERC staff requests the use of any revised EPA GWP values in future NEPA evaluations. Section 4.11.1.2 was revised to identify the source of the GWP values used in the analysis.

CO (Companies and Organizations)

CO9 - Sierra Club

IPCC, Climate Change 2013, The Physical Science Basis, Chapter 8, 713-14 (Sept. 2013).²⁰⁸ This report increased the 100-year-timeframe estimates methane from fossil fuels to 36 when the effects of oxidation are taken into account.²⁰⁹ *Id.* This report also explained that on a 20-year timeframe, methane's impact is even more severe, causing 87 times the warming of an equivalent mass of carbon dioxide (also accounting for the effects of oxidation). *Id.* The 20-year GWP for methane is particularly relevant because it corresponds much more closely to the average time that methane actually remains in the atmosphere before decaying into CO₂, which is 12.4 years.²¹⁰ There is no dispute that the Fifth Assessment Report values represent a more accurate estimate of the impact of each ton of methane emissions.²¹¹

CO9-62

More broadly, courts have consistently recognized that the IPCC summaries represent the scientific consensus.²¹² Here, the DEIS violates NEPA's obligation to use "high quality information," 40 C.F.R. § 1500.1(b) and provide "full and fair discussion of significant environmental impacts," 40 C.F.R. § 1502.1, by relying on an estimate of methane's impacts that

²⁰⁸ Attached as Exhibit 76, available at http://ipcc.ch/pdf/assessment-report/ar5/wg1/WG1AR5_Chapter08_FINAL.pdf.

²⁰⁹ For a discussion of the effects of oxidation on methane's GWP, see Bradbury, et al., Dep't of Energy, Office of Energy Policy and Systems Analysis, *Greenhouse Gas Emissions and Fuel Use within the Natural Gas Supply Chain – Sankey Diagram Methodology* (July 2015), at 10, n. ¶¶¶, available at https://www.energy.gov/sites/prod/files/2015/07/f24/OER%20Analysis%20-%20Fuel%20Use%20and%20GHG%20Emissions%20from%20the%20Natural%20Gas%20System%2C%20Sankey%20Diagram%20Methodology_0.pdf.

²¹⁰ See Exhibit 76, at 731, Appendix 8.A.

²¹¹ See Department of Energy, Order 3357-C, FE Docket 11-161-LNG, at 30 (Dec. 4, 2015), Exhibit 77 and available at https://fossil.energy.gov/ng_regulation/sites/default/files/programs/gasregulation/authorizations/2011/applications/or_d3357c.pdf; Environmental Protection Agency, Inventory of U.S. Greenhouse Gas Emissions and Sinks, 1-9 to 1-10 (Apr. 12, 2018), Exhibit 78 and available at https://www.epa.gov/sites/production/files/2018-01/documents/2018_complete_report.pdf; *id.* Annex 6, A-437, Exhibit 79 and available at https://www.epa.gov/sites/production/files/2018-01/documents/2018_annex_6.pdf.

²¹² *Massachusetts v. E.P.A.*, 549 U.S. 497, 508-512 (2007) (The IPCC is recognized as "a multinational scientific body ... [d]rawing on expert opinions from across the globe"); *Coal for Responsible Regulation, Inc. v. E.P.A.*, 684 F.3d 102, 119 (D.C. Cir. 2012), *aff'd in part, rev'd on other grounds in part sub nom. Util. Air Regulatory Grp. v. E.P.A.*, 134 S. Ct. 2427 (2014), and *amended sub nom. Coal for Responsible Regulation, Inc. v. Envtl. Prot. Agency*, 606 F. App'x 6 (D.C. Cir. 2015) (IPCC's "peer-reviewed assessments synthesized thousands of individual studies on various aspects of greenhouse gases and climate change and drew 'overarching conclusions' about the state of the science in this field.").

CO (Companies and Organizations)

CO9 - Sierra Club

was known to be outdated and an understatement of the true potency of this pollutant, by failing to disclose that the analysis it provided only considered long term (100-year) impacts, and by failing to use available tools, such as the estimate of methane’s 20-year GWP, to address more near-term impacts. Each of these failures violates NEPA. See *W. Org. of Res. Councils v. U.S. Bureau of Land Mgmt.*, No. CV 16-21-GF-BMM, 2018 WL 1475470, at *16 (D. Mont. Mar. 26, 2018) (holding that agency violated NEPA by estimating emissions solely on the basis of methane GWP of 25).

CO9-62

Third, the estimates provided in the DEIS do not include foreseeable indirect effects relating to gas production as use, as we discuss *infra*.

CO9-63

Fourth, the DEIS Provides no meaningful discussion of the significance or impacts, as well as the amount, of the greenhouse gas emissions associated with the project. *Sierra Club v. FERC*, 867 F.3d 1357, 1374 (D.C. Cir. 2017) (“*Sabal Trail*”). The DEIS presents emission estimates in part 4.11.1.3. This section recognizes that “[p]ublic comments expressed concern over the level of GHGs that would be emitted by the Project, as well as impacts on climate change,” but merely states that “[c]limate change is addressed in section 4.13.2.” DEIS 4-260. It appears that FERC forgot to include this discussion. Other than to simply quantify estimated construction-related (but not operational) greenhouse gas emissions from the two other Brownsville LNG Projects, this section provides *no* discussion of greenhouse gases or climate. Instead, the *only* discussion of the consequences or significance of GHG emissions provided anywhere in the DEIS are four sentences stating that no analysis is possible, presented in the executive summary and repeated in the conclusion:

CO9-64

The Rio Grande LNG Project would emit GHGs, which have the potential to contribute to climate change. There is no standard methodology to determine how the Project’s incremental contribution to GHGs would translate into physical effects on the

CO9-63

As described in section 1.3.1 of the EIS, the environmental and economic consequences of any induced natural gas production are outside the scope of this EIS. Production and gathering activities, and the pipelines and facilities used for these activities, are not regulated by FERC, but are overseen by the affected region’s state and local agencies with jurisdiction over the management and extraction of the shale gas resource. Determining the well and gathering line locations and their environmental impact is not feasible because the market and gas availability at any given time would determine the source of the natural gas. While past, present, and reasonably foreseeable future oil and gas infrastructure within the geographic scope of the cumulative impacts assessment are addressed in section 4.13, the specific locations for infrastructure associated with induced production are not reasonably foreseeable. Further, review of the Project is limited to the economic and environmental impacts of the proposal before the Commission; therefore, the effects of LNG combustion in end-use/importing markets are outside of the scope of this EIS. However, we revised section 4.13.2.9 to acknowledge that the construction and operation of the Project, as well as downstream emissions, would contribute incrementally to future climate change impacts.

CO9-64

Section 4.13.2.9 was revised to include a discussion on climate change of the effects of cumulative GHG emissions.

CO (Companies and Organizations)

CO9 - Sierra Club

global environment. However, the emissions would increase the atmospheric concentration of GHGs, in combination with past and future emissions from all other sources, and contribute incrementally to climate change. Because we cannot determine the Project's incremental physical impacts due to climate change on the environment, we cannot determine whether or not the Project's contribution to cumulative impacts on climate change would be significant.

DEIS ES-17, 5-22. This assertion is demonstrably false: extensive peer-reviewed literature documents the physical impacts of climate change. Last year, the U.S. Global Change Research Project again confirmed and quantified a broad range of environmental impacts resulting from greenhouse gas emissions,²¹³ including discussing how changes in temperature, rainfall, and flood risk from sea level rise will vary for individual regions in the United States.²¹⁴ Last month, this same federal project discussed impacts that are *already occurring* in communities around the country.²¹⁵

Because the tools used to assess current and future impacts of climate change respond to different emission scenarios, it is possible to meaningfully discuss the *incremental* impact of the emissions at issue here. Greenhouse gas emissions are largely interchangeable—an additional 10 million tons of carbon dioxide emitted in 2030, for example, will have the same impact regardless of whether it is emitted as a result of the Rio Grande LNG Project or as a result of some other activity elsewhere in the world. FERC appears to assume that it would be infeasible to run climate models to compare global emission scenarios that diverge by only 10 million tons per year, although FERC provides no evidence or discussion showing this to be the case. Even if such

²¹³ U.S. Global Change Research Program, 2017: Climate Science Special Report: Fourth National Climate Assessment, Volume I, doi: 10.7930/J0J964J6 (Nov. 3, 2017), available at https://science2017.globalchange.gov/downloads/CSSR2017_FullReport.pdf and attached as Exhibit 80.

²¹⁴ See, e.g., *id.* at 334.

²¹⁵ U.S. Global Change Research Program, 2018: Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II, doi: 10.7930/NCA4.2018 (Nov. 2018), Exhibit 81 and available at https://nca2018.globalchange.gov/downloads/NCA4_Report-in-Brief.pdf.

CO9-65

The EIS fully describes the anticipated climate change impacts on the Project region in section 4.13.2.9. The Project would comply with EPA GHG reporting and permitting rules. There is no generally accepted significance criteria for GHG emissions. If the EPA establishes a GHG significance level, the Commission would apply said level to projects under its jurisdiction.

CO9-65

CO (Companies and Organizations)

CO9 - Sierra Club

modeling is unavailable, however, FERC provides no reason why the impact of Rio Grande LNG emissions cannot be interpolated from comparisons of more divergent emission scenarios. Indeed, this type of comparison and interpolation was used to develop the Interagency Working Group's social cost of carbon protocol.²¹⁶ Thus, FERC has not demonstrated that it would be impossible or exorbitantly expensive to provide a reasonable prediction of nanometers of sea level rise or fractions of a degree of temperature increase attributable to the Projects' incremental emissions. 40 C.F.R. § 1502.22(a).

CO9-65

Furthermore, and more fundamentally, such forecasts are not essential to NEPA analysis. Climate change is the quintessential cumulative impact problem, and the individual physical changes that will result from any particular action will inevitably appear insignificant to the public. Just as the public and decisionmakers "cannot be expected to convert curies or mrems into such costs as cancer deaths," the EIS's readership cannot be expected to understand whether an individual project's miniscule marginal increase contribution to increased temperature, sea levels, etc. is cause for concern. *Natural Res. Def. Council, Inc. v. U. S. Nuclear Regulatory Comm'n*, 685 F.2d 459, 487 n.149 (D.C. Cir. 1982) *rev'd on other grounds sub nom. Baltimore Gas & Elec. Co. v. Natural Res. Def. Council, Inc.*, 462 U.S. 87, 106-107 (1983). Because individual contributions to climate change are so small, but the cumulative problem is so large, meaningfully disclosing the impact of greenhouse gas emissions requires some tool beyond merely identifying physical changes in the environment attributable to an individual project's emissions.

CO9-66

The most appropriate tool is the protocol developed by the Interagency Working Group on the Social Cost of Greenhouse Gases ("IWG"). NEPA does not, of course, require agencies to monetize adverse impacts in all cases. *See* 40 C.F.R. § 1502.23. The statute does, however,

²¹⁶ Social Cost of Carbon 2010, <https://obamawhitehouse.archives.gov/sites/default/files/omb/forego/for-agencies/Social-Cost-of-Carbon-for-RIA.pdf>, attached as Exhibit 82, at 24-25.

CO9-66

Section 4.13.2.9 of the final EIS was revised to assess the appropriateness of the SCC analysis to determine the significance of Project GHG emissions. We recognize the availability of the SCC tool, but conclude that it is not appropriate for use in project analyses. See Comment Response CO8-1 for additional information.

require FERC to take a hard look at the “ecological ..., aesthetic, historic, cultural, economic, social, [and] health,” effects of its actions, “whether direct, indirect, or cumulative.” 40 C.F.R. § 1508.8. Monetization of costs may be required where available “alternative mode[s] of [NEPA] evaluation [are] insufficiently detailed to aid the decision-makers in deciding whether to proceed, or to provide the information the public needs to evaluate the project effectively.” *Columbia Basin Land Prot. Ass’n v. Schlesinger*, 643 F.2d 585, 594 (9th Cir. 1981); *see also Ctr. for Biological Diversity v. Nat’l Highway Traffic Safety Admin.*, 538 F.3d 1172, 1201 (9th Cir. 2008) (NHTSA violated NEPA where it failed to monetize the benefits of GHG emission reductions from more stringent fuel economy standards even while it monetized the adverse costs of such standards due to depressed automobile sales and employment).

In another recent case concerning an energy infrastructure project, where the agency’s NEPA analysis quantified greenhouse gas emissions but claimed that it was impossible to discuss the effects thereof, the court ruled that the agency’s refusal to use the social cost of carbon to illustrate the impact of these emissions was arbitrary and capricious. *High Country Conservation Advocates v. United States Forest Serv.*, 52 F. Supp. 3d 1174, 1190-91 (D. Colo. 2014); *see also Montana Env’tl Info. Ctr. v. U.S. Office of Surface Mining*, 274 F. Supp. 3d 1074, 1097 (D. Mont. 2017), *amended in part, adhered to in part sub nom. Montana Env’tl. Info. Ctr. v. United States Office of Surface Mining*, No. CV 15-106-MDWM, 2017 WL 5047901 (D. Mont. Nov. 3, 2017).

Although they likely underestimate the true costs of GHG emissions, the IWG’s social cost metrics remain the best estimates yet produced by the federal government for monetizing the impacts of GHG emissions and are “generally accepted in the scientific community,” 40 C.F.R. § 1502.22(b)(4). This is true notwithstanding Executive Order 13,783, which disbanded the

Interagency Working Group and formally withdrew its technical support documents.²¹⁷ Indeed, that Executive Order did not find fault with any component of the IWG's analysis. To the contrary, it encourages agencies to "monetiz[e] the value of changes in greenhouse gas emissions" and instructs agencies to ensure such estimates are "consistent with the guidance contained in OMB Circular A-4."²¹⁸ The IWG tool, however, illustrates how agencies can appropriately comply with the guidance provided in Circular A-4: OMB participated in the IWG and did not object to the group's conclusions. As agencies follow the Circular's standards for using the best available data and methodologies, they will necessarily choose similar data, methodologies, and estimates as the IWG, since the IWG's work continues to represent the best estimates presently available.²¹⁹ Thus, the IWG's 2016 update to the estimates of the social costs of greenhouse gases remains the best available and generally accepted tool for assessing the impact of greenhouse gas emissions, notwithstanding the fact that this document has formally been withdrawn.²²⁰

In other proceedings, FERC has offered various arguments against using the social cost of carbon protocol that all seriously misunderstand the tool. The estimates of social cost are based on reasonable forecasts of the actual physical effects greenhouse gas emissions will have on the environment, including temperature, sea level rise, ecosystem services, and other physical impacts, together with assessments of how these physical changes will impact agriculture, human health, *etc.* The social cost protocol identifies the social cost imposed by a ton of emissions' pro

²¹⁷ Exec. Order. No. 13,783 § 5(b), 82 Fed. Reg. 16,093 (Mar. 28, 2017).

²¹⁸ *Id.* § 5(c).

²¹⁹ Richard L. Revesz et al., *Best Cost Estimate of Greenhouse Gases*, 357 SCIENCE 6352 (2017) (explaining that, even after Trump's Executive Order, the social cost of greenhouse gas estimate of around \$50 per ton of carbon dioxide is still the best estimate), available at http://policyintegrity.org/files/publications/Science_SCC_Letter.pdf and attached as Exhibit 83.

²²⁰ U.S. Interagency Working Group on the Social Cost of Greenhouse Gases (IWG), "Technical support document: Technical update of the social cost of carbon for regulatory impact analysis under executive order 12866 & Addendum: Application of the methodology to estimate the social cost of methane and the social cost of nitrous oxide" (August 26, 2016), available at https://obamawhitehouse.archives.gov/sites/default/files/omb/infoeg/scc_tsd_final_clean_8_26_16.pdf and attached as Exhibit 84.

rata contribution to these environmental problems. As explained above, this either amounts to an assessment of physical impacts or the best available generally accepted alternative to such an assessment; either way, the tool is appropriate for use under NEPA. 40 C.F.R. § 1502.22(b)(4).

Nor is lack of consensus as to a single most appropriate intergenerational discount rate a reason for refusing to use the social cost protocols. As the 2010 Technical Support Document explained, a range of three discount rates—2.5, 3, and 5 percent—“reflect reasonable judgments” and “span a plausible range” of appropriate discount rates, and are consistent with OMB Circular A-4.²²¹ (The IWG also recommended use of a 3 percent rate at the 9^{5th} percentile to model climate “tipping points”).

Although some analysts assert that any analysis of multi-generational, potentially catastrophic problem such as climate change merits a lower discount rate than this range would reflect, the IWG’s “central” value of 3 percent falls within the range supported by a majority of economists.²²² Indeed, the Circular itself provides a general recommendation for a 3 percent rate; and while it also identifies 7 percent rate as appropriate for use in other circumstances, the Circular itself states that the 7 percent figure should not be used when assessing impacts that, like climate change, will affect the public as a whole. Furthermore, OMB, together with the rest of the Interagency Working Group, has explicitly affirmed that the 7 percent rate is inappropriate when addressing climate change.²²³ Thus, as explained by the IWG, uncertainty as to the most appropriate discount rate is a reason to provide social cost estimates using the range of plausible

²²¹ IWG 2010 Social Cost of Carbon TSD at 17-18, 23.

²²² See Peter Howard & Derek Sylvan, *The Economic Climate: Establishing Expert Consensus on the Economics of Climate Change* (Inst. Policy Integrity Working Paper 2015/1); M.A. Drupp, et al., *Discounting Disentangled: An Expert Survey on the Determinants of the Long-Term Social Discount Rate* (London School of Economics and Political Science Working Paper, May 2015) (finding consensus on social discount rates between 1-3%).

²²³ Interagency Working Group on the Social Cost of Carbon, *Response to Comments: Social Cost of Carbon for Regulatory Impact Analysis under Executive Order 12,866* at 36 (July 2015), available at <https://obamawhitehouse.archives.gov/sites/default/files/omb/infocore/scc-response-to-comments-final-july-2015.pdf> and attached as Exhibit 85.

CO (Companies and Organizations)

CO9 - Sierra Club

rates—which FERC and other agencies have done in other proceedings²²⁴—but it is not a reason for ignoring the social cost of greenhouse gas emissions entirely. *Center for Biological Diversity*, 538 F.3d at 1200 (disagreement over cost of carbon emissions does not allow agency to forgo estimating cost where, “while the record shows ... a range of values, the value of carbon emissions reduction is certainly not zero.”).²²⁵

Finally, estimating social cost of greenhouse gas emissions will help the public and FERC understand whether the adverse consequences of the Projects’ emissions are severe enough to warrant consideration in the public interest/public convenience and necessity analyses, and, indeed, whether these emissions tip the balance toward the conclusion that the project is contrary to, and not required by, the public convenience and necessity. The current DEIS provides no information to use in answering these questions; it is indisputable that estimating the impacts of emissions using the social cost protocols would speak to these issues, regardless of whether FERC concludes that the monetized impact is or is not significant. Although FERC has discretion to choose among reliable methodologies for evaluating impacts, that discretion does not allow FERC to provide *no* evaluation whatsoever when a generally accepted methodology is available. 40 C.F.R. § 1502.22(b)(4), *see also N. Plains Res. Council, Inc. v. Surface Transp. Bd.*, 668 F.3d 1067, 1085 (9th Cir. 2011) (holding that agency decision not to survey for wildlife prior to approving project was not a valid exercise of discretion as to assessment methodology).

²²⁴ *See, e.g.*, FERC, Final EIS, Constitution Pipeline and Wright Interconnect Projects, CP13-499 (Oct. 2014), Accession No. 20141024-4001, at 4-256 to 4-257 (“For 2015, the first year of project operation, ... the project’s social cost of carbon for 2015 would be \$1,638,708 at a discount rate of 5 percent, \$5,325,802 at 3 percent, and \$8,330,100 at 2.5 percent.”).

²²⁵ As explained in Sierra Club’s concurrently filed joint comment, a growing body of literature suggests that the discount rate used for assessing climate harms should be lower than 3 or even 2.5 percent, reflecting both the decline in general interest rates since Circular A-4 was adopted and the particular nature of climate harms. Using a lower discount rate would *increase* the estimate of the social cost of carbon; thus, the IWG estimates do not risk overstating impacts.

CO9-67

Section 4.13.2.9 of the final EIS was revised to assess the appropriateness of the SCC analysis to determine the significance of Project GHG emissions. We recognize the availability of the SCC tool, but conclude that it is not appropriate for use in Project analyses. See Comment Response CO8-1 for additional information.

CO9-67

IX. The DEIS Fails to Adequately Address Connected, Indirect, and Cumulative Actions, Including Production and Use of the Exported Gas

Authorization of the Rio Grande LNG Terminal and the Rio Bravo Pipeline (hereafter the “Project”) will have foreseeable indirect effects on the price, production, and use of natural gas in the United States. Because NEPA requires an agency to engage in a wide-ranging inquiry, including connected actions, indirect effects, and other foreseeable consequences, FERC must consider these impacts in its EIS.

A. The EIS Must Address the Impacts of Cooperating Agencies’ Decisions

The DEIS states that the “environmental and economic consequences” of project-induced increases in gas production and use are outside the scope of the DEIS because FERC does not regulate “these production and gathering activities” – instead, states and local agencies do.²²⁶ An agency is not exempt from including indirect environmental impacts simply because local or state agencies have control over much of the relevant regulatory process. FERC’s potential authorization of the Project would be a cause of increases in gas production and use notwithstanding the fact that other government entities also regulate these effects. FERC observes in the DEIS that “production and gathering activities ... are overseen by the affected region’s state and local agencies.”²²⁷ However, NEPA would “wither away in disuse, [if] applied only to those environmental issues wholly unregulated by any other federal, state or regional body.”²²⁸

Nor does the Department of Energy’s role in approving gas exports relieve FERC of the obligation to address the impacts of gas production and use in the EIS. Commenters recognize that the D.C. Circuit has held that the Department of Energy’s approval of exports, rather than FERC’s approval of the construction and operation of export infrastructure, is the “legally

²²⁶ DEIS Table 1.3-2.

²²⁷ DEIS Table 1.3-2.

²²⁸ *Calvert Cliffs’ Coordinating Comm., Inc. v. U.S. Atomic Energy Comm’n*, 449 F.2d 1109, 1122-23 (D.C. Cir. 1971).

CO9-68

Section 1.2 of the EIS identifies the cooperating agencies participating in development of the EIS and each agency’s permit reviews applicable to the Project. As appropriate throughout the EIS, agency permitting actions and associated mitigation are addressed.

The Sierra Club implies that the DOE’s approval of the export of LNG necessitates the analysis of impacts associated with end uses of natural gas exported by the Project. Section 4.13.2.9 has been updated to include a discussion of the Project’s contribution towards climate change. Review of the Project is limited to the economic and environmental impacts of the proposal before the Commission; therefore, the effects of LNG combustion in end-use/importing markets are outside of the scope of this EIS.

CO9-68

relevant cause,” for purposes of NEPA review, of indirect effects on gas production and use.

Sierra Club v. FERC, 827 F.3d 36, 47-49 (D.C. Cir. 2016) (“*Freeport I*”) (citing *Department of Transp. v. Public Citizen*, 541 U.S. 752, 764, 771 (2004)). However, *Freeport I* explicitly declined to address “the interplay between the Commission and the Department of Energy when the former is acting as the ‘lead agency’ in reviewing the environmental effects of a natural gas export operation under NEPA,” whether FERC’s decision to exclude gas production from its EIS “impermissibly ‘segmented’ its review of the [terminal] Projects from the larger inter-agency export authorization process,” or whether “Commission’s construction authorizations and the Department’s export authorizations qualified as ‘connected actions’ for purposes of NEPA review.” *Id.* at 45-46. The Court could not have been clearer about the fact that *Freeport I* did not resolve these issues: “Before addressing the merits of the Associations’ NEPA claim, we pause to underscore what we are not deciding in this case.” *Id.* at 45. No subsequent case addressing LNG exports has discussed these issues.

Consideration of these issues left undecided by *Freeport I* and its progeny plainly demonstrates that the Department’s authorization of exports *is* a “connected action,” which must be fully analyzed in the terminal EIS. 40 C.F.R. § 1508.25(a)(1). According to NEPA’s binding regulations:

Actions are connected if they:

- (i) Automatically trigger other actions which may require environmental impact statements.
- (ii) Cannot or will not proceed unless other actions are taken previously or simultaneously.
- (iii) Are interdependent parts of a larger action and depend on the larger action for their justification.

Id. “The point of the connected actions doctrine is to prevent the government from ‘segmenting’

CO (Companies and Organizations)

CO9 - Sierra Club

its own ‘federal actions into separate projects and thereby failing to address the true scope and impact of the activities that should be under consideration.’” *Big Bend Conservation All. v. FERC*, 896 F.3d 418, 423–24 (D.C. Cir. 2018) (quoting *Sierra Club v. U.S. Army Corps of Eng’rs*, 803 F.3d 31, 49–50 (D.C. Cir. 2015) and *Del. Riverkeeper Network v. FERC*, 753 F.3d 1304, 1313 (D.C. Cir. 2014)).

It is clear that the decisions of cooperating agencies identified in part 1.5 of the DEIS, 1-18 to 1-25, and the Department of Energy’s approval in particular, *are* connected actions, the consequences of which must be fully considered in *this* EIS. 40 C.F.R. § 1508.25(a)(1). By refusing to consider the impacts of connected actions, FERC impermissibly segments NEPA review. *Delaware Riverkeeper Network v. FERC*, 753 F.3d 1304, 1313 (D.C. Cir. 2014). The proposed exports cannot proceed without construction and operation of the terminal and pipeline, and the various projects depend on one another for their justifications. 40 C.F.R. § 1508.25(a)(1)(ii)-(iii). The Department’s evaluation of the application to export LNG to non-free-trade-agreement countries is an action that “may require [an] environmental impact statement[];” *id.* § 1508.25(a)(1)(i); indeed, the Department has already concluded that “[a]pprovals or disapprovals of authorizations to import or export natural gas” involving construction or significant modification of export facilities, or even a “major increase in the quantity of [LNG] imported or exported” from existing facilities, will “normally require [an] EIS.” 10 C.F.R. Pt. 1021 Subpt., D App. D, D8-D9.

The connection between FERC’s decision and the Department’s is made particularly clear by the Energy Policy Act of 2005, which, in FERC’s own words, “amended the Natural Gas Act to require [FERC] to coordinate the environmental review and the processing of all federal

CO9-69

Section 1.2 of the EIS identifies the cooperating agencies participating in development of the EIS and each agency’s permit reviews applicable to the Project. As appropriate throughout the EIS, agency permitting actions and associated mitigation are addressed. The comment seems to assert that the DOE’s approval of the export of LNG necessitates the analysis of impacts associated with end uses of natural gas exported by the Project. The EIS does not refuse to acknowledge that combustion of natural gas would result in environmental impacts, and we revised section 4.13.2.9 to acknowledge that the construction and operation of the Project, as well as downstream emissions, would contribute incrementally to future climate change impacts. However, the DOE’s approval of the export of LNG does not include the authority over end uses of the natural gas exported by the Project. Review of the Project is limited to the economic and environmental impacts of the proposal before the Commission; therefore, the effects of LNG combustion in end-use/importing markets are outside of the scope of this EIS.

CO9-69

authorizations relating to proposals for natural gas infrastructure under FERC's jurisdiction."²²⁹
See also Freeport I, 827 F.3d at 41 (discussing 15 U.S.C. § 717n(b)(1), 42 U.S.C. § 7172(a)(2)(B)). Because Congress has instructed FERC to prepare the EIS the Department of Energy and other cooperating agencies will use in satisfying their NEPA obligations, FERC cannot reasonably contend that this EIS need not include the effects of these other agencies' actions.

CO9-69

B. The Effects of Increased Gas Production and Use Are Reasonably Foreseeable

An increase in gas production and use is a reasonably foreseeable indirect effect of both the FERC and Department of Energy actions regarding the Rio Grande and Rio Bravo Projects.

NEPA requires agencies to consider and disclose the "indirect effects" of their actions.²³⁰ Indirect effects are "caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable."²³¹ An effect 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."²³² Indirect effects encompass both "growth inducing" and "economic" effects, including "induced changes in the pattern of land use, population density or growth rate."²³³ The indirect effects inquiry is therefore wide-ranging in its scope.

The courts have consistently required that agencies extend their analyses to include effects similar to those ignored here by FERC. Where a new runway will foreseeably induce additional

²²⁹ Federal Energy Regulatory Commission, Guidance for Federal and State Agencies for the Processing of Federal Authorizations in Cooperation with the FERC, 1, attached as Exhibit 86 and available at <https://www.ferc.gov/industries/gas/enviro/epact-gas-guidance.pdf>.

²³⁰ 40 C.F.R. § 1508.8(b).

²³¹ *Id.*

²³² *Mid States Coal. for Progress v. Surface Transp. Bd.*, 345 F.3d 520, 549 (8th Cir. 2003) (quotations omitted).

²³³ 40 C.F.R. § 1508.8(b).

air traffic, the agency must assess the impacts of that traffic.²³⁴ Where a railway would reduce the cost of delivered coal, the agency must address the foreseeable possibility of an increase in coal consumption and the effects thereof.²³⁵ And in approving a port and causeway providing access to a previously isolated island, the agency was required to consider the effects of foreseeably induced “industrial development” thereon.²³⁶

Here, it is clear that exports from the proposed terminal will result in an increase in gas production, processing, and transportation—the exported gas will have to come from somewhere. The DEIS’s assertion that the location of increased production is speculative cannot be squared with Rio Grande’s own assertions about the likely source of supply, or with available modeling tools. Many of the impacts of additional gas production and associated activity can be evaluated at the regional level. But even if FERC were correct, and the site of induced activity was entirely unknowable, FERC would still be able to meaningfully discuss the extent of climate impacts and the nature of non-climate effects. We discuss these issues in turn below

CO9-70

1. The Proposed Projects Will Increase Gas Production

Rio Grande argues that the Project will provide “indirect benefits due to enhanced natural gas exploration and production.” Application at 26. The Rio Bravo pipelines will allow “the physical delivery of natural gas produced in Texas’ natural gas producing regions,” as well as, more broadly, other gas producing regions. *Id.* at 22. In Rio Grande’s parallel application to the Department of Energy, Rio Grande argues that the “Project’s proximity to the Eagle Ford and conventional South Texas natural gas production makes those areas good candidates for providing

²³⁴ *Barnes v. U.S. Dep’t of Transp.*, 655 F.3d 1124, 1138-39 (9th Cir. 2011).

²³⁵ *Mid States*, 345 F.3d at 549-50.

²³⁶ *Sierra Club v. Marsh*, 769 F.2d 868, 878-79 (1st Cir. 1985).

CO9-70

The commentor contends that the proposed Project and other planned LNG export projects, if constructed and operated, will cause an increase in environmental impacts from induced gas production and pipeline transportation. While it is reasonable to assume that export of natural gas could result in increased natural gas production, where this gas would come from is speculative and would likely change throughout the decades of operation of the Project. Our analysis of cumulative impacts of the Project, including air quality and climate change impacts, is included in section 4.13.2 of the EIS.

natural gas for export.”²³⁷

The Application relies on an economic report that extensively discusses, and attempts to quantify, the economic impact of this additional production. The Perryman Group, “*The Potential Impact of the Proposed Rio Grande Liquefied Natural Gas (LNG) and Rio Bravo Pipeline Facilities on Business Activity in Cameron County, Texas, and the United States*” (Dec. 2015) (attached at Resource Report 5.B).²³⁸ The Perryman Report argues that the Rio Grande facility will “support[] the development of natural gas reserves,” *id.* at 2; that “The Rio Grande LNG project would help ensure the ongoing maintenance and development of US natural gas resources by providing access to world markets. . . . The ability to export domestic gas as LNG greatly expands the market scope and access for domestic natural gas producers, encouraging domestic production at times when US market prices might not otherwise be favorable,” *id.* at 6; that the benefits of the Project include “enhanced exploration and production of natural gas,” *id.* at 7; and that, without expanded LNG exports, domestic gas production may decrease, *id.* at 5. Other resource reports filed by the applicants similarly argue that one of the benefits of the Project will be “an increase in domestic production of natural gas.”²³⁹

The Applicants’ claim that the proposed Projects will cause an increase in gas production is consistent with the view of the Energy Information Administration, Environmental Protection Agency, Department of Energy, and every private consultant that has considered the issue. These tools provide predictions of the amount by which a given volume of exports, from a specific location or locations, will increase gas production in an individual state or gas basin. *See, e.g.,*

²³⁷ Application of Rio Grande LNG, LLC, FE Docket No. 15-190-LNG, at 21 (Dec. 23, 2015), Exhibit 87, available at https://www.energy.gov/sites/prod/files/2016/07/f33/Rio_Grande15_190-LNG_App.pdf; *see also id.* at 23, 37-38 (discussing Eagle Ford as likely source of supply).

²³⁸ Available at <http://elibrary.ferc.gov/IDMWS/common/opennat.asp?fileID=14070242>

²³⁹ Rio Grande LNG, LLC and Rio Bravo Pipeline Company, LLC, Resource Report 10: Alternatives (May 2016), at RR10-6.

ICF International, U.S. LNG Exports: Impacts on Energy Markets and the Economy at 18 (May 15, 2013) (explaining that ICF's model predicts production in individual basins),²⁴⁰ ICF International, U.S. LNG Exports: State-Level Impacts on Energy Markets and the Economy, at 15 (Nov. 13, 2013) (showing state-level increases in gas production in response to specific export volumes).²⁴¹ Another consultant has modeled how gas production in individual shale plays will respond to exports from an individual facility. Deloitte Marketpoint, Analysis of the Economic Impact of LNG Exports from the United States, at 8, 14.²⁴²

Similarly, the Energy Information Administration has repeatedly studied how U.S. energy markets will respond to LNG exports, predicting the amount by which gas production is expected to increase in response to a given volume of exports in various scenarios. *See* Energy Information Administration, Effect of Increased Levels of Liquefied Natural Gas Exports on U.S. Energy Markets, 12 (October 2014).²⁴³ In preparing this report, EIA predicted how different export scenarios would increase gas production in individual subregions (*e.g.*, Gulf Coast, Southwest).²⁴⁴ Moreover, the tool EIA used to prepare this analysis—the National Energy Modeling System—is routinely used to provide more fine-grained analysis, estimating changes in production in individual gas plays. *See* Energy Information Administration, Annual Energy Outlook 2018, at 68 (Feb. 6, 2018)²⁴⁵ (discussing individual predictions regarding gas production Eagle Ford, Haynesville, Permian, Utica, and Marcellus plays); Energy Information Administration, Oil and

²⁴⁰ Attached as Exhibit 88, available at <https://www.api.org/~media/Files/Policy/LNG-Exports/API-LNG-Export-Report-by-ICF.pdf>.

²⁴¹ Exhibit 89, available at <https://www.api.org/~media/Files/Policy/LNG-Exports/API-State-Level-LNG-Export-Report-by-ICF.pdf>.

²⁴² Attached as Exhibit 90; initially filed as Exccelerate Liquefaction Solutions I, LLC, FE Docket 12-146-LNG, Application for Non-FTA Export Authorization, Appendix F (Oct. 5, 2012), available at https://fossil.energy.gov/ng_regulation/sites/default/files/programs/gasregulation/authorizations/2012/applications/12_146_lng_nfta.pdf.

²⁴³ Attached as Exhibit 91, available at <https://www.eia.gov/analysis/requests/fe/pdf/lng.pdf>.

²⁴⁴ See Exhibit 92, available online at (select Publication: "Effect of Increased Natural Gas Exports on Domestic Energy Markets" and Table: "Lower 48 Natural Gas Production and Wellhead Prices by Supply Region").

²⁴⁵ Attached as Exhibit 93, available online at <https://www.eia.gov/outlooks/aeo/pdf/AEO2018.pdf>.

CO (Companies and Organizations)

CO9 - Sierra Club

Gas Supply Module of the National Energy Modeling System: Model Documentation 2018, at 9 (June 2018) (explaining that NEMS is a “play-level model”).²⁴⁶ No agency has ever disputed that EIA’s tools can be used to provide reasonable forecasts of how LNG exports from particular sites will increase gas production in individual gas plays.

In summary, the Applicants state that the Projects will increase gas production; common sense and every available expert analysis confirm that increasing exports will increase gas production, and numerous tools exist to provide quantitative forecasts of how much additional production will result, and of how this added production will be allocated among gas plays or producing regions. An increase in gas production is a therefore a reasonably foreseeable indirect effect of FERC’s approvals or of other agency actions connected thereto.

2. The Environmental Impacts of Increased Gas Production, Processing, and Transport are Reasonably Foreseeable

The DEIS does not deny that an increase in natural gas production will occur because of FERC’s authorization of the Project, or that FERC can reasonably foresee the amount of this increase. Instead, FERC claimed in the DEIS that the “specific locations for infrastructure associated with induced production are not reasonably foreseeable,” and that this places these impacts outside the scope of the DEIS.²⁴⁷ FERC is mistaken.

First, analysis of the climate impacts of additional gas production does not depend on knowing the specific locations where gas production and other activities will occur.²⁴⁸

Second, other impacts also occur at the regional level, and can be meaningfully forecast on

²⁴⁶ Attached as Exhibit 94, available online at [https://www.eia.gov/outlooks/aeo/nems/documentation/ogsm/pdf/m063\(2018\).pdf](https://www.eia.gov/outlooks/aeo/nems/documentation/ogsm/pdf/m063(2018).pdf).

²⁴⁷ DEIS Table 1.3-2.

²⁴⁸ See Department of Energy, *Addendum to Environmental Review Documents Concerning Exports of Natural Gas from the United States*, at 2 (August 15, 2014) (“With the exception of greenhouse gases (GHG) and climate change, potential impacts of expanded natural gas production and transport would be on a local or regional level.”) (emphasis added), attached as Exhibit 95, available at <https://www.energy.gov/sites/prod/files/2014/08/f18/Addendum.pdf>.

CO9-71 See Comment Response CO9-70.

CO9-72 As discussed in section 1.3 of the final EIS, production, extraction, and end-use of natural gas are not part of the scope of the EIS. While it is reasonable to assume that export of natural gas could result in increased natural gas production, gas can come from several production areas. It is possible that over the life of the Project, gas may be sourced from new or different regions as wellhead prices and takeaway capacity change. Although environmental and economic models do exist to estimate market changes based upon gas flows into and out of markets, ultimately this type of analysis is out of scope for NEPA. Our analysis of cumulative impacts of the Project, including air quality and climate change impacts, is included in section 4.13.2 of the EIS.

Similarly, the effects of LNG combustion in end-use/importing markets are outside of the scope of this EIS. Additionally, the DC Circuit court held in *Sierra Club v. FERC* (No. 14-1249) and *Sierra Club and Galveston Baykeeper v. FERC* (No. 14-1275) that FERC’s NEPA environmental reviews do not need to include indirect impacts resulting from increased natural gas exports, such as increased natural gas production. In addition, it held that the DOE, not FERC, has responsibility as the agency that approves export of the commodity.

CO9-71

CO9-72

the basis of basin- or play-level predictions of gas production, precisely the types of forecasts discussed in the previous section. Most importantly, FERC can foresee how regional increases in gas production will impact regional ozone levels (both in the region where the increase occurs *and in surrounding regions*). Ground-level ozone is formed by the interaction of volatile organic chemicals and nitrogen oxides, and has serious impacts on human health and the environment. EPA has explained that ozone formation and impacts often occur “on a regional scale (*i.e.*, thousands of kilometers).” 76 Fed. Reg. 48,208, 48,222 (Aug. 8, 2011). In some regions, gas production is the primary contributor to ozone levels that violate EPA’s national ambient air quality standards.²⁴⁹

Available models, including the Comprehensive Air-quality Model with extensions (“CAMx”), can predict how an increase in gas production in an individual gas play will affect ozone levels in neighboring regions. One study used this tool to predict that increasing gas development in the Haynesville Shale would significantly impact ozone throughout east Texas/west Louisiana region.²⁵⁰ Nothing indicates that it would be infeasible or exorbitantly expensive to perform similar modeling here. 40 C.F.R. § 1502.22(a). To the contrary, the Bureau of Land Management has performed a similar CAMx analysis to evaluate how gas development on federal land would affect ozone in surrounding regions, as part of NEPA review for a land management plan revision.²⁵¹ Similarly, EPA demonstrated that it was feasible to model the impact a new rule regarding major sources of air pollution would have on individual ozone regions nationwide. EPA, *Regulatory Impact Analysis for the Federal Implementation Plans to*

CO9-72

²⁴⁹ Department of Energy, *Addendum* at 28.

²⁵⁰ Susan Kembell-Cook, *et al.*, *Ozone Impacts of Natural Gas Development in the Haynesville Shale*, 44 *Envtl. Sci. & Tech.* 9357, 9360-61 (2010), DOI: 10.1021/es1021137, attached as Exhibit 96.

²⁵¹ Bureau of Land Management, Continental Divide-Creston Natural Gas Development Project EIS, Air Quality Technical Support Document (Apr. 15, 2016), attached as Exhibit 97, available at <https://eplanning.blm.gov/epl-front-office/eplanning/planAndProjectSite.do?methodName=dispatchToPatternPage¤tPageId=77531>.

Reduce Interstate Transport at 60-61 (June 2011).²⁵²

Finally, even for impacts that are local in nature, uncertainty as to the specific locations where incremental gas production will occur does not permit FERC to ignore the impact entirely. Even if the precise “*extent*” of these effects is not reasonably foreseeable, the “*nature*” of these effects is, and as such, FERC “may not simply ignore the effect.”²⁵³ For example, in *Mid States*, the court ruled that an agency must address the foreseeable possibility of an increase in coal consumption and the effects thereof, due to the construction of a railway reducing the cost of delivered coal.²⁵⁴ An agency may not ignore “the construction of additional [coal-fired] power plants” that may result merely because the agency does not “know where those plants will be built, and how much coal these new unnamed power plants would use.”²⁵⁵ Thus, FERC must disclose, *in the EIS*, the fact and nature of these foreseeable effects of gas production that will be induced by the Projects.

CO9-72

3. The Proposed Projects Will Increase Overseas Gas Use

The Projects will also have foreseeable indirect effects resulting from the shipping, regasification, and use of exported LNG. Each of these activities will emit foreseeable amounts of greenhouse gases. The Department of Energy has already demonstrated that it is possible to quantitatively estimate emissions from use of LNG for electricity generation, and other published literature estimates emissions from other foreseeable uses of LNG.²⁵⁶

CO9-73

These emissions are foreseeable, and must be disclosed, even if FERC is unsure as to how foreign energy markets as a whole will balance in response to exported LNG. *See* DEIS 3-2 to 3-

²⁵² Attached as Exhibit 98, available at <https://www3.epa.gov/crossstaterule/pdfs/FinalRIA.pdf>

²⁵³ *Mid States*, 345 F.3d at 549.

²⁵⁴ *Id.*

²⁵⁵ *Id.*

²⁵⁶ Gilbert, A. Q. & Sovacool, B. K., “US liquefied natural gas (LNG) exports: Boom or bust for the global climate?,” *Energy*, Volume 141, December 15, 2017, pp. 1671-1680. <https://doi.org/10.1016/j.energy.2017.11.098>, attached as Exhibit 99.

CO9-73

The EIS does not refuse to acknowledge that combustion of natural gas would result in environmental impacts. However, the DOE’s approval of the export of LNG does not include the authority over end uses of the natural gas exported by the Project, and the specific uses of the exported gas are not known. Review of the Project is limited to the economic and environmental impacts of the proposal before the Commission; therefore, the effects of LNG combustion in end-use/importing markets are outside of the scope of this EIS. Additionally, the DC Circuit court held in *Sierra Club v. FERC* (No. 14-1279) and *Sierra Club and Galveston Baykeeper v. FERC* (No. 14-1275) that FERC’s NEPA environmental reviews do not need to include indirect impacts resulting from increased natural gas exports, such as increased natural gas production. In addition, it held that the DOE, not FERC, has responsibility as the agency that approves export of the commodity.

3. FERC cannot justify its failure to take a hard look at foreseeable emissions resulting from burning LNG exported via the Projects by speculating that other, more attenuated fuel substitution, might provide an unknown degree of mitigation. Moreover, the DEIS offers no analysis to support its speculation that all or even most of exported LNG will be used in place of coal or other sources of natural gas. Notably, recent peer reviewed research concludes that US LNG exports are likely to play only a limited role in displacing foreign use of coal, and such that US LNG exports are likely to increase net global GHG emissions.²⁵⁷ This recent research was not before the agencies in *Freeport II*, 867 F.3d at 202, and demonstrates that there are now tools to perform a more careful and informative analysis than was done in that case.

CO9-73

C. DOE's Prior Analyses of Indirect Effects Are Insufficient

DOE, in its notice of Rio Grande's application, states that DOE will "consider" to general environmental reports DOE prepared in 2014: a summary of the impacts of natural gas production, and an analysis of the life-cycle greenhouse gas impact of U.S. LNG exports. 81 Fed. Reg. 46918, 46919 (July 19, 2016).

CO9-74

NEPA, however, requires that discussion of environmental impacts be provided *in the EIS*. Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations, 46 Fed. Reg. 18026, 18034 (Mar. 23, 1981). The propriety of DOE's past reliance on these non-NEPA materials is another issue that the D.C. Circuit has explicitly declined to uphold, instead concluding that the issue was not before it. *Freeport II*, 867 F.3d at 197.

Moreover, these materials are out of date, and do not reflect the enormous amount of research regarding the impacts of gas production that has been published since they were issued. Physicians, Scientists, and Engineers for Healthy Energy maintains a database of peer-reviewed

²⁵⁷ See, e.g., Gilbert et al. 2017, *supra* note 256.

CO9-74

The comment pertains to the DOE's notice of RG Developers' Application, which is not under FERC's jurisdiction. Section 4.13.2.9 of the final EIS was revised to acknowledge that the construction and operation of the Project, as well as downstream emissions, would contribute incrementally to future climate change impacts. Review of the Project is limited to the economic and environmental impacts of the proposal before the Commission; therefore, the effects of LNG combustion in end-use/importing markets are outside of the scope of this EIS.

literature regarding the environmental and public health impacts of shale and tight gas production, the Repository for Oil and Gas Energy Research.²⁵⁸ This database identifies 1,548 publications dated after August, 2014.²⁵⁹ FERC cannot rely on material DOE published in 2014, years before the pending applications were even submitted, without taking a hard look at whether that material continues to constitute “high quality information,” 40 C.F.R. § 1500.1(b) and provide “full and fair discussion of significant environmental impacts,” 40 C.F.R. § 1502.1.

One example of how DOE’s 2014 materials no longer represent the scientific consensus is that recent data indicates much higher greenhouse gas emission rates for gas production. These materials assert that 1.3 and 1.4 percent of extracted gas is released as methane between the well and liquefaction facility.²⁶⁰ This estimate was based on “bottom-up” methodology, which aggregated measurements of emissions from individual components—*e.g.*, measurement of an individual pneumatic controller. Even at the time these reports were published, “top-down” studies, which measure total changes in atmospheric methane concentrations around gas production sites, indicated that these figures were a gross underestimate of total emissions.²⁶¹ More recent and more thorough bottom up studies have affirmed that the DOE’s 2014 estimates were too low, and has generally supported the estimates provided by earlier top-down analyses, estimating that roughly 2.3% of extracted natural gas leaks to the atmosphere.²⁶²

²⁵⁸ <https://www.psehealthyenergy.org/our-work/shale-gas-research-library/>

²⁵⁹ https://www.zotero.org/groups/248773/pse_study_citation_database/items/order/dateModified/sort/desc (last visited Nov. 30, 2018).

²⁶⁰ Export LCA, 6-8.

²⁶¹ See, e.g. Brandt, A.R., *et al.*, *Methane Leaks from North American Natural Gas Systems*, *Science*, Vol. 343, no. 6172 at pp. 733-735 (Feb. 14, 2014), attached as Exhibit 100.

²⁶² Alvarez *et al.*, Assessment of methane emissions from the U.S. oil and gas supply chain, *Science* 361, 186–188 (Jul. 13, 2018), DOI: 10.1126/science.aar7204, attached as Exhibit 101 and available at <http://science.sciencemag.org/content/early/2018/06/20/science.aar7204>

X. The DEIS Fails to Adequately Address Cumulative Impacts

An EIS must consider not only the direct adverse impacts of a project, but also its probable secondary, indirect, and cumulative impacts. A project's "cumulative impact" is defined in the federal regulations as "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 Fifth Circuit has held that a "meaningful cumulative-effects study must identify: (1) the area in which effects of the proposed project will be felt; (2) the impacts that are expected in that area from the proposed project; (3) other actions—past, proposed, and reasonably foreseeable—that have had or are expected to have impacts in the same area; (4) the impacts or expected impacts from these other actions; and (5) the overall impact that can be expected if the individual impacts are allowed to accumulate." *Fritiofson v. Alexander*, 772 F.2d 1225, 1245 (5th Cir. 1985) (citing *Cabinet Mountains Wilderness/Scotchman's Peak Grizzly Bears v. Peterson*, 685 F.2d 678, 683-84 (D.C. Cir. 1982)).

The DEIS undertakes a cumulative impacts analysis, concluding that the greatest potential for cumulative impacts would be on soils, surface water quality, vegetation, wildlife, aquatic resources, threatened and endangered species, visual resources, land- and water-transportation, air quality, and noise. DEIS ES-15; 4-370. Significant impacts to some of these resources are expected. The comments above identify flaws in the cumulative impacts analysis for some specific resources (e.g., habitat for endangered species). But the analysis fails to satisfy the "hard look" NEPA standard for additional reasons.

First, FERC's analysis of past actions and its approach to the incremental analysis from

CO9-75

CO9-75

We disagree. As addressed further in section 4.13.1, our selected approach with past actions is consistent with CEQ Guidance that allows agencies to adopt a broad, aggregate approach. Specifically, past actions are captured in the environmental baseline described in other sections of the EIS and against which the impacts of reasonably foreseeable future actions are considered.

proposed and reasonably foreseeable actions is insufficient. The DEIS takes a “broad, aggregated approach” to past actions. DEIS 4-371. In practice, this means simply describing the current regional landscape on a high level without actually analyzing past actions’ impact on resources that will be affected by the Rio Grande LNG Project. For example, in its wetlands analysis, FERC aggregates the total known wetland impacts associated with the Rio Grande LNG Project and other known projects to arrive at 546.9 acres of impact. The agency then derives an estimated total acreage of wetlands present in the Bahia Grande-BSC HUC-12 subwatershed, and performs an incremental analysis of the impacts relative to this total acreage. *See* DEIS 4-403. No further description or analysis of past wetland impacts, whether qualitative or quantitative, is included in the DEIS.

CO9-75

The CEQ regulations on cumulative impacts first require the regulatory agency to look at the “incremental impact” of a project; the incremental impact must then be added to the environmental baseline, which includes all past and present actions that impact the affected area. 40 C.F.R. § 1508.7. By combining the incremental impact with the environmental baseline of impacts to the same affected resource, an agency can determine the total impacts to the area. In undertaking this analysis, it is imperative to understand the total cumulative impacts from existing, proposed, and reasonably foreseeable projects because the proposed action may be the “straw that breaks the back of the environmental camel,” *Hanly v. Kleindienst*, 471 F.2d 823, 832 (2d Cir. 1972), resulting in overall significant impacts on the area. But the DEIS fails to quantify the past impacts (even in aggregate form) to many resources.

By employing an erroneous form of ‘incremental analysis,’²⁶³ federal agencies will presumably be able to authorize, for example, the destruction of all remaining wetlands, as long as

²⁶³ The Court of Appeals for the D.C. Circuit has recognized that an “incremental analysis” approach fails to comply with statutory requirements. *Grand Canyon Trust v. FAA*, 290 F.3d 339, 341 (D.C. Cir. 2002).

CO (Companies and Organizations)

CO9 - Sierra Club

each increment is small relative to the body of wetlands that that remain in a watershed, without accounting for wetlands that have already been destroyed by past actions. The same is true for many affected resources. This is contrary to the Fifth Circuit’s holding in *Fritiofsen*, which requires the agency to identify “the overall impact that can be expected if the individual impacts are allowed to accumulate.”²⁶⁴ FERC must include a detailed analysis of the impacts that already exist in this sub-region of Texas for each affected resource to serve as an environmental baseline to which the impacts from this project and other foreseeable projects is added. The analysis in the DEIS fails to meet this requirement.

CO9-75

Second, the 404(b)(1) Guidelines echo the importance of assessing cumulative impacts. The fundamental policy of the 404(b)(1) Guidelines is that “dredged or fill material should not be discharged into the aquatic ecosystem, unless it can be demonstrated that such a discharge will not have an unacceptable adverse impact either individually or in combination with known and/or probable impacts of other activities affecting the ecosystems of concern,”²⁶⁵ including specific wetland types (e.g., mangrove habitat). The DEIS fails to adequately disclose cumulative impacts to specific aquatic resources and without a final mitigation plan being made available concurrent with the DEIS, it is not possible for the public to meaningfully comment on the cumulative impacts to these resources.

CO9-76

Third, the Air Cumulative Analysis appended to the DEIS is flawed. DEIS App. O. The analysis recognized that many of the public scoping comments expressed concern over cumulative air quality impacts from emissions of the three LNG terminals proposed along the BSC. The analysis compiled the cumulative impacts for five criteria pollutants (NO₂, CO, PM_{2.5}, PM₁₀, and SO₂) at specified averaging periods for comparison to the primary NAAQS. App. O at

CO9-77

²⁶⁴ 772 F.2d at 1245.

²⁶⁵ 40 C.F.R. § 230.1(c) (emphasis added).

CO9-76

Section 4.13.2.2 of the final EIS was revised to include the cumulative wetland impacts of the proposed Rio Grande LNG, Annova LNG, and Texas LNG Terminals, by wetland cover type. However, this assessment does not change our conclusion that impacts on wetlands would be adequately mitigated to meet the requirements of the CWA. Therefore, cumulative wetland impacts would not be significant. While some information was still pending at the time of issuance of the draft EIS, the lack of this final information does not deprive the public of a meaningful opportunity to comment on a substantial adverse environmental effect of the Project or a feasible way to mitigate or avoid such effect. The draft EIS included sufficient detail to enable the reader to understand and consider the issues raised by the proposed Project and addresses a reasonable range of alternatives.

CO9-77

Section 4.13.2.9 of the final EIS was revised to include a cumulative impact analysis for ozone.

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CO9 - Sierra Club

1. However, the Clean Air Act has set NAAQS for six common air pollutants; the cumulative impacts analysis fails to include ground-level ozone (O₃). See DEIS 4-235 (recognizing the EPA establishing NAAQS for these six criteria pollutants). A cumulative impacts analysis should be undertaken for ozone based on TCEQ modeling guidance. This analysis should be disclosed to the public.

CO9-77

This is particularly important because there is an inconsistency between the information provided in the DEIS and information in the TCEQ's modeling analysis regarding RG LNG's projected maximum 8-hour ozone impacts. The DEIS states that its modeling estimated the maximum 8-hour ozone impacts of the Project to be 2.3 parts per billion of ozone, which, when considered with the background concentration of 57 ppb, would not exceed the standard of 70 ppb. DEIS 4-258. However, the TCEQ Executive Director's Source Analysis and Technical Review came to a significantly different conclusion.²⁶⁶ The air quality analysis for ozone, based on EPA Region 6 guidance, found that the highest five year average for NOx would be 3.87 ppb and the 8-year maximum predicted increase of ozone would be 11.6 ppb.²⁶⁷ Adding 11.6 ppb to the 8-hour ozone background of 57 ppb will result in 68.6 ppb of ozone at a distance of 10km – without any other sources added.²⁶⁸ It stands to reason that additional sources, including Texas LNG and Annova LNG, could result in a cumulative impact exceeding the ozone standard at a distance of 10km. This discrepancy must be reconciled by FERC during its review and a cumulative analysis, based on EPA guidance for PSD analysis for ozone, must be undertaken for all three LNG projects.

CO9-78

To take the required hard look at a proposed project's effects, an agency may not rely on

²⁶⁶ See Exhibit 102, TCEQ Interoffice Memorandum for Rio Grande LNG, LLC's NSR Authorization No. 140792/PSDTX 1498 (Nov. 16, 2018).

²⁶⁷ *Id.* at 12.

²⁶⁸ *Id.* at 13.

CO9-78

TCEQ's Construction Permit Source Analysis & Technical Review for the Project was not available at the time of publication of the draft EIS. We revised our analysis in section 4.11.1.3 of the final EIS to include the TCEQ's conclusion regarding O₃ impacts. Section 4.13.2.9 of the final EIS was revised to include a cumulative impact analysis for ozone.

incorrect assumptions or data in the NEPA document. *Native Ecosystems Council v. U.S. Forest Service*, 418 F.3d 953, 964 (9th Cir. 2005). The cumulative air analysis notes that the Texas LNG concentration ranks differ from TCEQ modeling guidance. The DEIS analysis of air quality impacts further deviates from the conclusions in TCEQ materials. FERC must take a hard look at the data, assumptions, and conclusions in this cumulative impacts analysis to satisfy its NEPA obligations.

XI. Conclusion

For the reasons state above, FERC's draft EIS for the Rio Grande LNG export terminal and associated Rio Bravo pipeline fails to satisfy the requirements of the National Environmental Policy Act. Accordingly, FERC cannot move forward with approving these Projects without addressing these deficiencies with either a revised draft EIS or, less preferably, a draft supplemental EIS, either of which must be circulated for further public review and comment.

Respectfully submitted December 3, 2018,

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CERTIFICATE OF SERVICE

I hereby certify that I have this day served the foregoing document upon each person designated on the official service list compiled by the Secretary in this proceeding.

Dated at Oakland, CA this 3rd day of December, 2018.



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