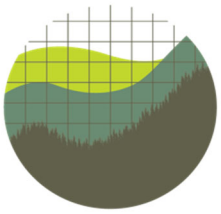

Institute *for*
Policy Integrity
NEW YORK UNIVERSITY SCHOOL OF LAW

March 20, 2024

To: U.S. Department of Energy

Re: Programmatic Review of Liquefied Natural Gas Export Program

Submitted: Via e-mail to DOE (and posted publicly on policyintegrity.org)

The Institute for Policy Integrity at New York University School of Law[1] respectfully submits this letter to offer suggestions for the Department of Energy's (DOE) upcoming review of the liquefied natural gas (LNG) export program.

In January, the White House announced a pause on LNG export approvals until DOE "update[s] the underlying analyses for authorizations."[2] In particular, the announcement notes that the "economic and environmental analyses DOE uses to underpin its LNG export authorizations" do not "adequately account for" key considerations like "the impact of greenhouse gas emissions."[3]

This letter offers recommendations for updating DOE's analyses. To ensure a robust public interest analysis that rationally weighs the impacts of export approvals, we urge DOE to:

- **Compare the benefits and costs of further LNG exports against one another**, including macroeconomic and climate impacts.

- **Update its analysis of climate costs** by:
  - Considering **new data** in assessing lifecycle emissions;
  - Rigorously assessing gas export's impacts on global energy supply and demand, including using the federal government's **available substitution models**;
  - Monetizing climate effects using the **latest climate-damage valuations** from the U.S. Environmental Protection Agency (EPA), which reflect the best available science and economics; and
  - Incorporating rational assumptions about the **uptake of downstream carbon capture** technology.

- **Update its analysis of macroeconomic impacts** by:
  - Quantifying the **distribution of consumer welfare benefits and costs**;

[1] This document does not purport to present the views of New York University School of Law, if any. Policy Integrity is a non-partisan think tank dedicated to improving the quality of government decisionmaking through advocacy and scholarship in the fields of administrative law, economics, and public policy.
[2] The White House, Fact Sheet: Biden-Harris Administration Announces Temporary Pause on Pending Approvals of Liquefied Natural Gas Exports (Jan. 26, 2024), https://perma.cc/YE3Y-H4SU.
[3] *Id.*

- Updating its **energy-market projections** using expert elicitation; and
- Refining its estimation of gas **supply and demand elasticities**.

- Conduct a **robust environmental justice analysis** that considers the impacts of LNG export terminals on affected communities using the best available methods.

- **Rescind its categorical exclusion** for LNG exports.

These recommendations build on two reports and a comment letter that Policy Integrity has previously produced:

1) The Climate Costs and Economic Benefits of LNG Export (2024); and

2) Comments Supporting Rescission of Categorical Exclusion for Discretionary LNG Exports, in Response to Request for Information (2022).

Those documents are appended hereto so that they are readily available as DOE updates its analyses.

I. DOE Should Weigh the Costs and Benefits of Additional LNG Export and Should Not Approve Further Export Unless It Concludes that the Benefits Justify the Costs

DOE has previously conducted analyses of both the lifecycle climate costs[4] and macroeconomic benefits[5] of LNG exports. (As detailed below, DOE should improve both analyses.) Although these analyses both present impacts in dollar terms, DOE has never used those values to compare the costs of LNG export to its benefits. This omission is particularly noteworthy because federal agencies, including DOE, routinely conduct benefit-cost analysis for important federal programs. Although cost-benefit analysis is most common in rulemaking,[6] agencies sometimes conduct cost-benefit analysis for programmatic evaluations including those involving energy supply.[7]

[4] *See* Dep't of Energy, Alaska LNG Project Final Supplemental Environmental Impact Statement ch.4.19 (Jan. 2023) [hereinafter 2023 Supplemental Analysis]; *see also* SELINA ROMAN-WHITE ET AL., NAT'L ENERGY TECH. LAB'Y, DOE/NETL-2019/2041, LIFE CYCLE GREENHOUSE GAS PERSPECTIVE ON EXPORTING LIQUEFIED NATURAL GAS FROM THE UNITED STATES: 2019 UPDATE (2019), https://perma.cc/Q7R9-YWE5 [hereinafter 2019 LIFE CYCLE REPORT].

[5] NERA ECONOMIC CONSULTING, MACROECONOMIC OUTCOMES OF MARKET DETERMINED LEVELS OF U.S. LNG EXPORTS (2018) [hereinafter 2018 MACROECONOMIC STUDY].

[6] *See* Exec. Order No. 12,866 § 1(b)(6), 58 Fed. Reg. 51,735, 51,735 (Oct. 4, 1993). DOE, like other executive agencies, routinely conducts cost-benefit analysis for economically significant regulations.

[7] *See, e.g.*, BOEM, 2024–2029 NATIONAL OUTER CONTINENTAL SHELF OIL AND GAS PROPOSED FINAL PROGRAM ch. 5-3 (2023) (presenting results of net benefits analysis); BOEM, ECONOMIC ANALYSIS METHODOLOGY FOR THE 2024–2029 NATIONAL OUTER CONTINENTAL SHELF OIL AND GAS LEASING PROGRAM (2023) (describing economic methodology).

Doing so is particularly appropriate here given DOE's mandate to balance a wide range of factors under the statutory "public interest" standard.[8]

In accordance with widespread agency practice, DOE should compare the costs and benefits of the LNG export program and not approve further export unless it determines that the benefits of such export justify its costs.[9] While a fully monetized cost-benefit analysis may be infeasible, DOE has already placed monetary valuations on perhaps the two most significant effects of LNG exports: its climate and macroeconomic impacts.[10] (As detailed below in Part II, DOE should update those monetary analyses to account for newer data and analytical developments.) Comparing monetized benefits and costs is thus particularly feasible and appropriate here.

Policy Integrity has conducted a comparison of climate costs and macroeconomic benefits using DOE's published studies. Through that analysis, we found that the "climate costs [of further export approvals] likely exceed economic benefits."[11] Specifically, using DOE's published studies, our report quantified the gross climate costs and consumer welfare benefits of an equivalent unit of LNG export.[12] We monetized gross climate costs using climate-damage valuations from EPA (released in 2023) and the Interagency Working Group on the Social Cost of Greenhouse Gases (last substantively updated in 2013).[13]

Our analysis concluded that gross climate costs of LNG export exceed economic benefits by a factor of 1.93 to 18.85, with a central cost-to-benefit ratio of 9.61 (assuming no downstream CCS use).[14] Even assuming full CCS use—creating a lower bound of lifecycle emissions—we found that gross climate costs and capture-technology costs exceed consumer welfare benefits by a factor of 1.80 to 7.41, with a central cost-to-benefit ratio of 4.35.[15] Though these ratios do not account for substitution effects, like whether LNG export could be displaced by energy production from other sources, they enable regulators to determine the "breakeven" substitution rate and compare that breakeven rate to the substitution rates derived in similar contexts. Through this method, we concluded that the substitution rate required for the benefits of LNG export to exceed costs is far lower than the Bureau of Ocean Energy Management found in its recent five-year leasing plan.[16] This finding indicates that the net climate costs of LNG export

[8] 15 U.S.C. § 717b(a); *see also* Dep't of Energy, Order Denying Petition for Rulemaking on Exports of Liquefied Natural Gas 12 (July 18, 2023) (describing DOE's assessment of "a variety of economic, environmental, and international considerations" in LNG export reviews) [hereinafter 2023 Order Denying Petition].
[9] *See* Exec. Order No. 12,866 § 1(a), 58 Fed. Reg. 51,735 (Oct. 4, 1993) ("Each agency shall assess both the costs and the benefits of the intended regulation and, recognizing that some costs and benefits are difficult to quantify, propose or adopt a regulation only upon a reasoned determination that the benefits of the intended regulation justify its costs.").
[10] *See supra* notes 4–5 and accompanying text.
[11] MINHONG XU & MAX SARINSKY, INST. FOR POL'Y INTEGRITY, THE CLIMATE COSTS AND ECONOMIC BENEFITS OF LNG EXPORT 1 (2024).
[12] *Id.* at 4–6 (describing methodology).
[13] *Id.* at 5–6.
[14] *Id.* at 8 tbl.3.
[15] *Id.* at 10 tbl.4.
[16] *See id.* at 8–9. Specifically, in our central scenario, we calculated that "climate costs exceed consumer welfare benefits if the net climate costs constitute more than roughly 10% (1/9.61) of the gross climate costs," meaning, in other words, that "leakage would need to be 90% or higher." *Id.* at 8. The "federal government has estimated far lower leakage rates" in other contexts—namely, the "Bureau of Ocean Energy Management's (BOEM) latest five-

likely exceed consumer welfare benefits, assuming the veracity of DOE's prior macroeconomic and lifecycle analysis.

Our analysis offers "a useful data point for DOE's re-evaluation of the LNG export program."[17] Nonetheless, further study of key uncertainties would be informative, including updating DOE's assessments of climate cost and economic benefit, engaging in a more rigorous analysis of substitution effects, and further evaluating the distributional effects of the LNG export program. Suggestions for these improvements are the subject of the next section.

II. To Ensure a Rigorous Assessment of Costs and Benefits, DOE Should Update Its Climate, Economic, and Distributional Analyses of the LNG Export Program

To ensure a robust accounting of relevant impacts, DOE should update its analyses of LNG export's climate and macroeconomic impacts. DOE should also rigorously assess LNG export's impacts on affected environmental justice communities.

A. DOE Should Update Its Assessment of Climate Impacts to Capture New Data and Methodologies and Rigorously Assess Energy Substitution

DOE can take numerous steps to improve its assessment of LNG export's climate impacts. DOE last published its greenhouse gas lifecycle emissions report in 2019.[18] Although DOE's study was limited at the time, new data and methodologies over the past five years have amplified the need for DOE to update its assessment. This section identifies four avenues for improvement.

First, DOE should update its lifecycle analysis to account for more recent data. Second, DOE should more rigorously assess the net climate impacts of gas export, including its effect on gas consumption and the global supply of different fuel types. This includes incorporating renewables into DOE's analysis and considering available energy-substitution models. Third, DOE should monetize greenhouse gas emissions using the Environmental Protection Agency's (EPA) latest climate-damage estimates. And fourth, if DOE incorporates downstream carbon sequestration into its analysis, it should make rational assumptions about its uptake.

1. DOE Should Update Its Lifecycle Emissions Estimates Considering Recent Data

The Department should reevaluate its assessment of lifecycle greenhouse gas emissions from gas export to account for new data. In recent years, researchers have further documented the extent of methane leaks in the gas supply chain.[19] Among these findings is a recent analysis showing that methane leaks may be so extensive that the lifecycle emissions from gas export may even

year offshore leasing plan estimates a total leakage rate of approximately 75% for proposed oil and gas lease sales from 2024 to 2029." *Id.* at 9 & n.51.

[17] *Id.* at 11.

[18] 2019 LIFE CYCLE REPORT, *supra* note 4.

[19] *E.g.* Ramon A. Alvarez et al., *Assessment of Methane Emissions from the U.S. Oil and Gas Supply Chain*, 361 SCIENCE 186 (2018). *See also* MIT Climate, How Much Does Natural Gas Contribute to Climate Change Through CO2 Emissions When the Fuel Is Burned, and How Much Through Methane Leaks? (July 17, 2023), https://perma.cc/2HEB-FMTW (synthesizing recent studies finding methane leaks "are likely undercounted" in U.S. government analyses).

exceed those from coal.[20] Though this comment takes no position on the accuracy of that or any other single lifecycle assessment, DOE should assess whether new evidence alters its prior findings and adjust its lifecycle emissions estimates as appropriate.

2. DOE Should Analyze Important Substitution Considerations, Including the Potential Displacement of Renewable Fuels, and Consider Using Energy-Substitution Models from Other Federal Agencies

In its 2019 lifecycle report, DOE simply compared the lifecycle emissions of exported U.S. gas to the lifecycle emissions of other potential fossil-fuel energy sources (namely coal and other gas imports) in destination countries.[21] In essence, it assumed a one-for-one substitution of exported gas for other fossil-fuel sources.

This analysis had several critical limitations. For one, it did not consider the potential for exported gas to displace non-fossil-fuel energy sources in destination countries, including (but not limited to) rapidly growing wind and solar energy. More broadly, DOE's analysis failed to consider how U.S. exports would affect global energy consumption by increasing gas supply and displacing a mix of different fuels.[22] It ignored the economic reality that "fossil-fuel projects affect the relative prices of different energy sources, increasing the total consumption of the targeted commodity while decreasing total consumption of other energy sources."[23]

DOE acknowledged these limitations in 2023 in its analysis of the Alaska LNG Project, when it recognized that exported gas may displace renewables and increase fossil-fuel consumption.[24] But despite this critical acknowledgment, its actual analysis was very limited. It did not use any tools or models to assess substitution effects, nor did it perform quantitative modeling beyond two extreme and simplistic scenarios (full-substitution and zero-substitution).[25] Without reliable

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[20] Robert W. Howarth, *The Greenhouse Gas Footprint of Liquefied Natural Gas (LNG) Exported from the United States*, Working Paper (2023).

[21] 2019 LIFE CYCLE REPORT, *supra* note 4.

[22] *See generally* PETER HOWARD & MAX SARINSKY, INST. FOR POL'Y INTEGRITY, BEST PRACTICES FOR ENERGY SUBSTITUTION ANALYSIS 3–5 (2022) (cautioning against "perfect substitution" and recommending that agencies "assess changes in supply and demand resulting from the addition of an energy source").

[23] *Id.* at 2. A recent paper finds that LNG export decreases *domestic* electric-sector emissions by raising the price of natural gas in the United States. James H. Stock & Matthew Zaragoza-Watkins, *The Market and Climate Implications of U.S. LNG Exports*, Nat'l Bur. Econ. Rsch. Working Paper 32228 (2024). Though insightful, this paper does not constitute a full climate analysis and is not inconsistent with our analysis for two reasons. First, as the authors highlight, the paper does not address dynamics in international markets where LNG export could reduce gas prices in destination countries and lead to increased emissions. *See id.* at 24. Additionally, as the authors explain, the paper focuses on power-sector emissions and not the full "life-cycle emissions associated with LNG exports, including methane emissions leaks through the LNG supply chain." *Id.* at 24. While this paper could help inform relevant pieces of DOE's analysis, the authors explain that it does not constitute a "full analysis of climate impacts" due to these two critical limitations. *See id.*

[24] DOE, Order Affirming and Amending DOE/FE Order No. 3643-A Following Partial Grant of Rehearing, Order No. 3643-C at 23–24 (Apr. 13, 2013) ("[I]n the absence of the Project, markets likely would substitute a combination of other LNG and reduced global demand for LNG, including—over the term of the authorization—a range of emitting and non-emitting resources and reduced energy consumption.")

[25] *See id.* at 23–24 (recognizing that both perfect substitution and zero substitution are implausible and that "there are likely to be incremental GHG emissions associated with exports from the Project, as compared to global energy supply in the absence of the Project").

quantitative analysis, DOE ultimately considered substitution impacts through conjecture rather than analysis and modeling.[26]

DOE should conduct additional analysis on this key question. In particular, it should apply a substitution model that rigorously assesses LNG export impacts on the global energy market, including the price and quantity, and different fossil and non-fossil fuels. Available substitution models could facilitate a more robust analysis of these energy-market effects and thereby allow DOE to better estimate the net climate cost of LNG export.[27] Because these costs should ultimately factor into DOE's public interest analysis, DOE should assess them using the best available data and methodology.

To achieve the best results, DOE should use a model that includes a detailed global representation of disaggregated regional markets and detailed end-use sectors. There are several available possibilities:

- The Energy Information Administration's (EIA) World Energy Projection System, or WEPS. This model includes specification of international markets, covering 16 world regions by country or country groups to capture emissions from destination countries.[28]

- EIA's National Energy Modeling System, or NEMS. NEMS analyzes natural gas production, distribution, and prices in a state-level representation of the domestic pipeline network and a regional-level representation of Canada's and Mexico's network. Additionally, it integrates end-use consumption by sector, storage, and LNG export terminals into the network by demand region.[29]

- The Bureau of Ocean Energy Management's Market Simulation model, or MarketSim.[30] Because this model primarily focuses on the U.S. domestic market, it is suboptimal for DOE's analysis of the LNG export program. Nonetheless, the model is serviceable as it includes U.S. imports and exports, as well as international oil and gas supply and demand, and enables an analysis of energy-market impacts and downstream emissions worldwide.[31]

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[26] *See id.* at 24–25 ("[I]n DOE's judgment the GHG emissions and related climate impacts associated with Alaska LNG's exports—at the very least, those in the near to medium years of the approximately 33-year export—period—are likely to be closer to the difference between No Action Alternative 1 and the Project scenarios.").
[27] HOWARD & SARINSKY, *supra* note 22, at 4 (recommending available models).
[28] *See* Energy Info. Admin., World Energy Projection System (WEPS): Overview (last updated 2023), at 3. https://www.eia.gov/analysis/handbook/pdf/weps2023_overview.pdf.
[29] *See* Energy Info. Admin., NEMS—National Energy Modeling System: An Overview (2023), at 8 https://www.eia.gov/*analysis*/pdfpages/0581index.php.
[30] *See* Bureau of Ocean Energy Mgmt., Consumer Surplus and Energy Substitutes for OCS Oil and Gas Production: The 2023 Revised Market Simulation Model (MarketSim), BOEM 2023-055 (2023), https://espis.boem.gov/final%20reports/BOEM_2023-055.pdf.
[31] Peter H. Howard, Inst. for Pol'y Integrity, The Real Costs of Offshore Oil and Gas Leasing 2 (2022). https://policyintegrity.org/files/publications/Offshore_Leasing_Report.pdf

Whichever model DOE uses, it should consider how a decarbonization baseline will affect energy dynamics, and not just use a business-as-usual baseline that fails to capture the reality of ongoing decarbonization efforts.[32] In particular, current and future decarbonization actions undertaken by destination countries (and other nations) would significantly influence the substitution analysis. For example, among the destination countries considered in DOE's 2023 climate analysis for the Alaska LNG Project, Japan has recently accelerated its greenhouse gas emissions reduction goal from 26% to 46–50%, South Korea strengthened its target to achieve net zero emissions by 2050, and China pledged to peak coal use by 2025 and subsequently phase down coal consumption.[33]

Incorporating these actions into substitution modeling, along with other realistic projections of global decarbonization, will affect the substitution and net emission estimates from these models. Failing to account for future decarbonization, in particular, would likely produce an underestimate of net emissions from LNG export because it would produce an overestimate of gas-gas substitution and an underestimate of gas-renewable substitution.

3. DOE Should Monetize Greenhouse Gas Emissions Using EPA's Recent and Robust Climate-Damage Estimates

To enable an apples-to-apples comparison of climate costs to economic benefits, DOE should monetize climate impacts using the social cost of greenhouse gases (SC-GHG). DOE monetized greenhouse gas emissions using SC-GHG valuations developed by an interagency working group in its 2023 analysis of the Alaska LNG Project.[34] But the interagency working group last substantively updated those climate-damage values in 2013.[35] In late 2023, EPA published updated SC-GHG values following both peer and public review.[36] DOE should now use EPA's newer and more robust estimates.

EPA's updated values are the most robust and comprehensive federal SC-GHG estimates available. They implement the 2017 roadmap from the National Academies of Sciences for improving the existing Interagency Working Group estimates that DOE has previously used.[37] They also incorporate newer scientific and economic evidence.[38] Expert peer reviewers praised

[32] HOWARD & SARINSKY, *supra* note 22, at 5–7 ((explaining that substitution analysis must "consider long-term changes to the energy mix and not reflexively assume long-term reliance on fossil fuels").
[33] U.S. Dept. of State, Leaders' Summit on Climate: Day 1, Apr. 22, 2021, https://perma.cc/3X8A-KF4G; Climate Action Tracker, Warming Projections Global Update: May 2021 at 3 (2021), https://perma.cc/7JYN-N2DU
[34] 2023 Supplemental Analysis, *supra* note 4, at 4.19-12.
[35] These values were from the Interagency Working Group on the Social Cost of Greenhouse Gases (Working Group). In 2016, the Working Group made very slight adjustments to its 2013 valuations. In 2021, the Working Group readopted its 2016 valuations and adjusted them for inflation.
[36] ENV'T PROT. AGENCY, EPA REPORT ON THE SOCIAL COST OF GREENHOUSE GASES: ESTIMATES INCORPORATING RECENT SCIENTIFIC ADVANCES (2023).
[37] NAT'L ACAD. SCI., ENGINEERING & MED., VALUING CLIMATE DAMAGES: UPDATING ESTIMATION OF THE SOCIAL COST OF CARBON DIOXIDE (2017).
[38] *See* ENV'T PROT. AGENCY, *supra* note 36, at 46 fig.2.3.1 (comparing publication year of studies underlying EPA's estimates to those underlying Interagency Working Group estimates).

EPA's numbers as a "huge advance,"[39] a "significant step,"[40] and a "much-needed improvement"[41] that "advanc[es] our state of knowledge"[42] and "represents well the emerging consensus in the literature."[43]

In contrast, the Working Group's climate-damage estimates that DOE has previously used are largely outdated and widely recognized to understate the true costs of climate change. The Working Group itself has recognized its estimates undervalue climate damages[44] and encouraged federal agencies to use newer values that "reflect the best available evidence."[45] To best account for climate costs, therefore, DOE should use EPA's updated SC-GHG estimates. Although EPA's values also likely understate the costs of climate change due to omitted impacts,[46] they are robust and the best estimates currently available.

4. If DOE Accounts for Downstream Carbon Sequestration Technology, It Should Make Reasonable Assumptions About Uptake

In its 2023 climate analysis for the Alaska LNG Project, DOE analyzed two different scenarios: one with no downstream carbon capture and sequestration (CCS), and the other with full downstream CCS use.[47] Though both scenarios are extreme, the assumption of full CCS use is particularly implausible given that CCS is currently in limited use worldwide.[48] Insofar as it accounts for downstream CCS use, DOE should make reasonable assumptions about its uptake. Any sensitivity analysis assuming full CCS use should be considered a lower bound of climate costs.[49]

Moreover, if DOE assumes downstream CCS use in foreign countries, it should take those same uptake estimates into account in its analysis of supply, demand, and substitution. Given CCS's substantial cost,[50] widespread implementation in destination countries is likely to decrease gas

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[39] FINAL COMMENTS SUMMARY REPORT, EXTERNAL LETTER PEER REVIEW OF TECHNICAL SUPPORT DOCUMENT: SOCIAL COST OF GREENHOUSE GAS 7 (2023) (comments of Dr. Maureen Cropper).
[40] *Id.* at 9 (comments of Dr. Chris E. Forest)
[41] *Id.* at 10 (comments of Dr. Catherine Louise Kling)
[42] *Id.* at 14 (comments of Dr. Wolfram Schlenker).
[43] *Id.* at 15 (comments of Dr. Gernot Wagner).
[44] As of December 2023, there were only 40 commercial CCS facilities completed and/or operational, of which 17 are located in the United States. *See* Global CCS Inst., Facilities Database, https://co2re.co/FacilityData (last visited Dec. 11, 2023) (search for "Commercial CCS Facility" as Facility Category and both "Completed" and "Operational" under Facility Status).
[45] Interagency Working Grp., Memorandum from the Interagency Working Group on Social Cost of Greenhouse Gases (Dec. 22, 2023).
[46] ENV'T PROT. AGENCY, *supra* note 36, at 1 ("The[se] estimates are . . . a partial accounting of climate change impacts and likely underestimate the marginal benefits of [emissions] abatement"); *id.* at 87 tbl.3.2.1 (highlighting omitted impacts and damages).
[47] 2023 Supplemental Analysis, *supra* note 4, at 4.19-10 to -11 tbls.4.19-3 to -4.
[48] As of December 2023, there were only 40 commercial CCS facilities completed and/or operational, of which 17 are located in the United States. *See* Global CCS Inst., Facilities Database, https://co2re.co/FacilityData (last visited Dec. 11, 2023) (search for "Commercial CCS Facility" as Facility Category and both "Completed" and "Operational" under Facility Status).
[49] *See* XU & SARINSKY, *supra* note 11, at 10 (treating full-CCS estimates as "a lower bound of climate costs").
[50] [50] ENV'T PROT. AGENCY, GREENHOUSE GAS MITIGATION MEASURES CARBON CAPTURE AND STORAGE FOR COMBUSTION TURBINES TECHNICAL SUPPORT DOCUMENT 11 fig.7 (2023) (estimating an abatement cost of $41 per ton of CO_2, or $45 per metric ton).

demand and increase the supply of other energy resources, including wind and solar. DOE should account for CCS consistently across its analyses.

B. DOE Should Revisit Its Macroeconomic Analysis to Ensure Robust Assessment of Distributional Effects, Energy Trends, and Elasticities

DOE can also take numerous steps to improve its assessment of LNG export's macroeconomic impacts, which it last assessed in 2018.[51] As detailed below, DOE should update its macroeconomic analysis to better account for distributional impacts, energy trends, and gas supply and demand elasticities. By doing so, DOE will more accurately capture critical information it can use when determining whether further LNG export authorizations are in the public interest.

1. DOE Should Quantify the Distribution of Consumer Welfare Benefits and Costs

In the 2018 macroeconomic analysis, DOE found that gas export has consumer welfare benefits in the aggregate but not necessarily for all demographic groups. The winners from gas export, DOE explained, include those who "have specialized skills needed in the natural gas production industry" and those who "hold stock in natural gas producers, [who] will benefit from the increase in the value of their investment."[52] Others might partially "benefit from the additional wealth transferred into the U.S, which increases the value of the dollar and reduces prices of other imported goods" while also being harmed from rising gas prices due to the reduction in domestic supply.[53]

Further analysis into the distribution of these benefits and costs would clarify the impacts of LNG export. Whereas stockholders are disproportionately wealthy,[54] price changes particularly affect low-income individuals who spend a larger share of their income on staples like home heating and electricity.[55] These various dynamics mean that low-income Americans could see a reduction in consumer welfare even as LNG export increases consumer welfare overall by amplifying consumer welfare for already wealthy households. To assess this potential, DOE should quantify consumer welfare benefits and costs by income groups, considering the stock ownership and consumption patterns of different groups. Executive guidance endorses such a distributional analysis and supplies income groups as the default analytical unit.[56]

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[51] 2018 MACROECONOMIC STUDY, *supra* note 5.
[52] *Id.* at 64.
[53] *Id. See also* Stock & Zaragoza-Watkins, *supra* note 23, at 2 ("[T]he resulting increase in domestic prices due to LNG exports is approximately comparable to imposing a carbon tax on natural gas of $30 per metric ton (MT) of CO_2 emissions, and a carbon tax on coal of $20/MT[.]")
[54] SUSAN R. HOLMBERG, THE ROOSEVELT INSTITUTE, WHO ARE THE SHAREHOLDERS? 8 (2018) ("The middle class only owns 8 percent of all stock; by comparison, the top 1 percent owns almost 40 percent." (citing Edward Wolff, *Household Wealth in the United States, 1962 to 2016: Has Middle Class Wealth Recovered?*, Nat'l Bur. of Econ. Rsch, Working Paper Series no. 24085 (2017)).
[55] *See* Yuru Guan et al., *Burden of the Global Energy Price Crisis on Households,* 8 NATURE ENERGY 304 (2013) (finding that higher energy prices can push many people into extreme poverty).
[56] OFF. OF MGMT. & BUDGET, CIRCULAR A-4 at 61, 64–65 (2023).

This analysis could also help DOE contextualize gas export's macroeconomic impacts to account for distribution. For instance, DOE could provide supplemental estimates of consumer welfare that apply weights accounting for the diminishing marginal utility of goods.[57]

2. DOE Should Update Its Energy-Market Projections Using Expert Elicitation

DOE constructed its macroeconomic analysis by estimating the probability of various scenarios for domestic and international natural gas supply and demand.[58] While DOE correctly attempted to account for a broad range of uncertainties in future gas markets, its consultant should have estimated these probabilities through a formal expert elicitation rather than internally by the project team.[59] DOE should use elicitation in its update, to ensure it will rely on the best available data and analyses for any future public interest determination. Elicitation is "a formal, highly-structured and well-documented process for obtaining the judgments of multiple experts."[60] It is preferable to group deliberation because it incorporates the opinions of many experts and avoids the potential for groupthink.[61] DOE should employ statistical analysis methods to evaluate the probabilistic judgments of experts in cases of expert disagreement.[62]

DOE should also update its forecasts, as the probabilistic scenarios from the 2018 macroeconomic analysis are now outdated given the evolving landscape of energy demand and climate policy. In its 2019 analysis, for instance, the probability assigned to the scenario indicating aggressive demand for renewable energy sources, consistent with increased climate actions, stood as low as 17%.[63] In contrast, DOE assigned the scenario reflecting future natural gas demand aligned with 2017 projections, which is based on market conditions and policy regulations at that time, a higher probability of 66%.[64] In light of recent developments, including the Inflation Reduction Act and more aggressive state and international climate action, DOE should update its forecast through expert elicitation capturing current and anticipated conditions.

3. DOE Should Refine Its Estimation of Gas Supply and Demand Elasticities

DOE should also improve its approach to estimating gas supply and demand elasticities.

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[57] *See id.* at 65 ("Diminishing marginal utility means that an additional unit of a good is more valuable to a person (in welfare terms) if they have fewer total goods than if they have more total goods. Weights of this type are most commonly applied in the context of variation in net benefits by income, consumption, or other measures of economic status.").
[58] 2018 MACROECONOMIC STUDY, *supra* note 5, at 15, tbl.1.
[59] *Id.* at 42–43 (describing methodology and noting that after seeking feedback from peer reviewers on the proposed scenario probabilities and ranges, the consultant decided to retain the original assignments unless there was consensus among reviewers).
[60] ENV'T PROT. AGENCY, GUIDELINES FOR PREPARING ECONOMIC ANALYSES xiii (2016).
[61] PETER HOWARD & DEREK SYLVAN, INST. FOR POL'Y INTEGRITY, EXPERT ELICITATION AND THE SOCIAL COST OF GREENHOUSE GASES 4–5 (2021).
[62] *See* Emily Ho, *Not All Carbon Dioxide Emission Scenarios Are Equally Likely: A Subjective Expert Assessment*, 155 CLIMATIC CHANGE 545 (2019) (presenting experts' probability assessments of emission distribution for the year 2100 under a business-as-usual scenario and Paris Agreement scenario, and using them to derive a probability distribution function for carbon dioxide emissions).
[63] 2018 MACROECONOMIC STUDY, *supra* note 5, at 44 tbl.3.
[64] *Id*.

On the supply side, DOE should ensure that its elasticities match both empirical findings and theory. DOE's 2018 analysis derived gas supply elasticities from four sources[65] for each of three U.S. supply scenarios (high, reference, and low).[66] For the high-supply scenario, in which it assumes natural gas supply will increase at relatively low cost due to abundant resources and improved technologies, DOE's supply-elasticity estimates are lower than those for the reference and low-supply scenarios.[67] However, this projection stands in tension with empirical findings that gas supply elasticities increase with technological advancements and resource discoveries.[68]

DOE's supply elasticities also conflict with the trajectory of climate actions. Specifically, DOE adjusts supply elasticities linearly during the modeling period of 2020–2040, implicitly assuming that gas suppliers will become more flexible in adjusting production levels in response to price changes. But this projection is subject to uncertainties in future energy and climate policies. As continued climate actions may impose higher regulatory costs on gas suppliers, these suppliers may become less responsive to prices, leading to decreasing gas supply elasticities over time.[69]

DOE should also refine its methodology for estimating natural gas demand elasticities. Currently, the agency uses a logarithmic regression to calculate these elasticities, relying on data from the 2017 Annual Energy Outlook (AEO). First, DOE should update the input data to reflect the numerous climate actions and technological improvements since 2017. Second, DOE should update its approach to consider demand and price separately rather than simultaneously. Specifically, AEO projections are based on NEMS which provides a general equilibrium solution for annual U.S. energy supply and demand.[70] In this model, energy prices and quantities are derived based on an equilibrium between supply and demand within the system. Thus, the resulting demand elasticities do not capture only the responsiveness of energy demand to exogenous price changes, as the observed gas prices may also be influenced by shifts in gas demand. DOE should consider using econometric approaches, such as an instrumental variable, to address the endogeneity of natural gas prices. Alternatively, DOE may refer to other sources for reliable estimates of gas demand elasticities. In the absence of doing so, DOE's analysis will fail to reliably capture the effects of price changes on natural gas demand.

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[65] The four sources are EIA's Annual Energy Outlook (AEO) 2017, Kenneth Medlock at Rice University, ICF, and IHS. *Id.* at 89.
[66] *Id.* at 92.
[67] *Id.* at 92 tbl.17.
[68] Seth Wiggins & Xiaoli L. Etienne, *Turbulent Times: Uncovering the Origins of US Natural Gas Price Fluctuations Since Deregulation*, 64 ENERGY ECON. 196 (2017) ("[E]ven though natural gas supply in the US is in elastic, it has become more responsive to price changes in recent years after the shale boom".); Richard G. Newell et al., *Trophy Hunting Versus Manufacturing Energy: The Price Responsiveness of Shale Gas*, 62 J. ASSOC. ENV'T & RES. ECONOMISTS 391 (2019) ("[T]he gas supply is about three times more responsive during the 'shale era' of 2010–2015 compared to 2000–2005[.]").
[69] *See* PETER HOWARD ET AL., INST. FOR POL'Y INTEGRITY, THE REAL COSTS OF OFFSHORE OIL AND GAS LEASING 13 (2022).
[70] U.S. ENERGY INFO. ADMIN., THE NATIONAL ENERGY MODELING SYSTEM: AN OVERVIEW (2023), https://www.eia.gov/outlooks/archive/0581(2023).pdf.

C. DOE Should Analyze the Environmental Justice Impacts of LNG Export Terminals Using Best Available Methods

LNG production and export facilities are frequently proposed and located in or near environmental justice communities, which are primarily low-income communities, communities of color, and/or Indigenous and tribal communities.[71] These communities that bear the brunt of gas production and liquefaction for export often experience disproportionate cumulative effects of pollution, leading to health challenges such as asthma, lung and cardiovascular diseases, cancer, preterm births, and premature deaths.[72] Furthermore, environmental justice communities, such as in the Gulf Coast where many existing or pending LNG export facilities are located,[73] experience many of the initial and most severe consequences of extreme weather events linked to climate change, such as hurricanes and floods, which jeopardize community safety and resilience.[74] LNG facilities may also harm local fisheries[75] and ecologies.[76]

Despite these environmental justice implications, DOE has not closely studied the environmental justice impacts of the LNG export program. DOE cannot fully assess whether LNG exports are in the public interest without analyzing their environmental justice consequences, and should conduct this analysis as part of its upcoming LNG program review following best practices from other federal agencies.

1. DOE Should Consider Environmental Justice in Public Interest Determinations

DOE has a broad mandate to consider the "public interest" in most export determinations.[77] As the agency has recognized, this broad standard compels it to consider "any . . . factors bearing on the public interest" including "economic, environmental, and international considerations."[78] This includes environmental justice.

Indeed, several executive orders call on agencies to consider the impacts of their decisions on environmental justice communities and to integrate those impacts into their programmatic determinations. Under Executive Order 12898, agencies "shall make achieving environmental

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[71] *See* Aaron B. Flores et al., *Environmental Injustice in the Disaster Cycle: Hurricane Harvey and the Texas Gulf Coast*, 14 ENV'T JUSTICE 146 (2021).
[72] *See* Timothy Q. Donaghy et al., *Fossil Fuel Racism in the United States: How Phasing Out Coal, Oil, and Gas Can Protect Communities*, 100 ENERGY RSCH. & SOC. SCI. 103,104 (2023).
[73] LAURA A. FIGUEROA & SARAH LADIN, INST. FOR POL'Y INTEGRITY, THE PUBLIC INTEREST REVIEW FOR LNG-RELATED AUTHORIZATIONS vi (2022).
https://environmentalintegrity.org/wp-content/uploads/2020/10/LNG-Report-10.5.20-updated.pdf
[74] *See* ENV'T PROT. AGENCY, CLIMATE CHANGE AND SOCIAL VULNERABILITY IN THE UNITED STATES (2021).
[75] *See, e.g.*, Xander Peters, *LNG Production Comes With a Price, Gulf Communities Warm*, Env't Health News (Jan. 24, 2024), https://www.ehn.org/lng-environmental-justice-2666656588.html.
[76] Oil and Gas, U.S. Fish & Wildlife Serv. (last visited Mar. 6, 2024), https://perma.cc/87GC-JLXE.
[77] 15 U.S.C. § 717b(a). DOE lacks discretion when the export is directed to a country with which the United States has a gas-related free trade agreement. *Id.*
[78] 2023 Order Denying Petition, *supra* note 8, at 12. *See also The Department of Energy's Strategy for Exporting Liquefied Natural Gas: Hearing Before the Subcomm. on Energy Policy, Health Care and Entitlements of the H. Comm. on Oversight and Government Reform*, 113th Cong. 45 (2013) (statement of Christopher Smith, Acting Assistant Sec'y for Fossil Energy, Office of Fossil Energy, Dep't of Energy), https://perma.cc/L3GC-DB9W (noting that DOE considers "wide range of factors that Americans care about, everything from balance of trade, creation of jobs, GDP, impact of prices on consumers and American families, impact of prices on American industry, energy security and environmental issues").

justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations."[79] Executive Order 14008 likewise calls on agencies to "address the disproportionately high and adverse human health, environmental, climate-related and other cumulative impacts on disadvantaged communities."[80]

Executive Order 14096 calls on agencies to "advance environmental justice for all . . . by preventing pollution, addressing climate change and its effects, and working to clean up legacy pollution that is harming human health and the environment."[81] Moreover, it adds that federal agencies should "consider adopting or requiring measures to avoid, minimize, or mitigate disproportionate and adverse human health and environmental effects (including risks) and hazards of Federal activities on communities with environmental justice concerns, to the maximum extent practicable, and to address any contribution of such Federal activities to adverse effects—including cumulative impacts of environmental and other burdens—already experienced by such communities."[82]

Taken together, these orders—coupled with DOE's broad mandate to consider the "public interest"—require DOE to consider environmental justice in its LNG export determinations.

2. DOE Should Perform a Robust Environmental Justice Analysis Following Best Practices from Other Federal Agencies

Federal guidance offers insights on how DOE can conduct a robust environmental justice analysis. A good starting point for DOE would be replicating the analytical model that EPA articulated in its Technical Guidance for Assessing Environmental Justice in Regulatory Analysis (EJ Technical Guidance), which is currently being updated through a draft revision (Draft Revised EJ Technical Guidance).[83] EPA developed the EJ Technical Guidance to help analysts evaluate potential environmental justice concerns associated with regulatory actions, and based it on EPA's longstanding expertise and experience on environmental and environmental justice issues. Although the guidance was prepared for analyzing regulatory actions, it can also apply to a wholesale analysis of the LNG export program.[84] Because DOE's programmatic analyses inform all adjudicatory actions going forward, they merit careful examination on par with those underpinning regulatory action.

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[79] Exec. Ord. No. 12898 § 1-101, 59 Fed. Reg. 7629 (Feb. 11, 1994).
[80] Exec. Ord. No. 14008 § 219, 86 Fed. Reg. 7619 (Feb. 1, 2021).
[81] Exec. Ord. No. 14096 § 1, 88 Fed. Reg. 25251 (Apr. 21, 2023).
[82] *Id*. § 3(vi). This Order amends Executive Order 12898 by replacing the phrase "disproportionately high and adverse" with "disproportionate and adverse" to eliminate any potential misunderstanding that agencies should only be considering large disproportionate effects.
[83] Env't Prot. Agency, *Technical Guidance for Assessing Environmental Justice in Regulatory Analysis*, EPA-HQ-OW-2023-0222-213 (2016); Env't Prot. Agency, Draft Revision of Technical Guidance for Assessing Environmental Justice in Regulatory Analysis, EPA-HQ-OA-2013-0320 (Nov. 15, 2023). The draft revision reflects advancements in the state of the science, new peer-reviewed guidance documents, and priorities and directions related to the conduct of environmental justice analysis, including Executive Order 14096.
[84] DOE "relies on" other EPA environmental justice processes, including its "iconic EJSCREEN tool . . . . . to show which low-income communities or communities of color are facing the worst air pollution or public health risks." Dep't of Energy, Energy Justice Dashboard (BETA) (last visited Mar. 6, 2024), https://www.energy.gov/justice/energy-justice-dashboard-beta.

The EJ Technical Guidance and Draft Revised EJ Technical Guidance provide detailed recommendations on how to analyze environmental justice in federal actions. These documents also recommend that analysts assess whether environmental justice concerns exist before a proposed action and whether such concerns are exacerbated or mitigated for each action alternative under consideration. Specifically, the guidances provide detailed recommendations for analysts on performing the following steps of an environmental justice analysis[85]:

- Defining and identifying environmental justice communities
- Meaningfully involving environmental justice communities
- Identifying environmental justice concerns
- Analyzing environmental justice concerns by performing a baseline analysis, examining the impact of the action on population groups, and analyzing whether environmental justice concerns are mitigated, exacerbated, or unchanged by each federal action option
- Performing proximity-based analysis
- Performing comparison population group analysis to determine disproportionality
- Considering multiple stressors and cumulative effects
- Assessing vulnerability to climate change
- Assessing the economic distribution of costs and benefits
- Identifying and addressing key data, analytical and methodological gaps

In assessing the environmental justice impacts of the LNG export program, DOE should conduct each of these steps and follow the best practices laid out in EPA's guidance.

III. DOE Should Rescind Its Categorical Exclusion for LNG Exports

DOE's assessment of the LNG export program may lack staying power if the agency does not also repeal the existing categorical exclusion B5.7 for discretionary LNG export authorizations that it established in 2020 (LNG Export Categorical Exclusion Rule).[86] In December 2022, Policy Integrity submitted a comment letter urging DOE to withdraw this categorical exclusion.[87] As that letter explained, DOE has broad discretion when considering the "public interest" in its LNG export reviews.[88] The LNG Export Categorical Exclusion Rule, in contrast, rested on a narrow and incorrect view of DOE's authority and wrongly asserted that the agency cannot consider the induced climate effects of exported gas.[89] This view is compatible neither with

[85] *Id.*
[86] National Environmental Policy Act Implementing Procedures, 85 Fed. Reg. 78,197 (Dec. 4, 2020) [hereinafter LNG Export Categorical Exclusion Rule].
[87] Inst. for Pol'y Integrity, Comments Supporting Rescission of Categorical Exclusion for Discretionary LNG Exports, in Response to Request for Information (Dec. 22, 2022).
[88] *Id.*
[89] LNG Export Categorical Exclusion Rule, 85 Fed. Reg. at 78,197 (claiming that DOE has authority to consider only "marine transport effects").

historical agency practice nor with DOE's recent statements about its "public interest" authority.[90]

Because it rests on an improper legal foundation, DOE should rescind the categorical exclusion. Doing so is particularly urgent in light of DOE's review of the LNG export program, for two reasons. First, DOE's broad consideration of LNG export's climate impacts in application decisions is incompatible with the LNG Export Categorical Exclusion Rule. Second, the opportunity to apply a categorical exclusion to future export applications would upend the detailed analysis that DOE is currently undertaking to ensure that future export authorizations are the product of reasoned decisionmaking.

Sincerely,

Jennifer Danis, Federal Energy Policy Director
Al Huang, Environmental Justice Director
Max Sarinsky, Regulatory Policy Director
Minhong Xu, Economist

[90] 2023 Order Denying Petition, *supra* note 8, at 28 (discussing agency's historical practices and recognizing that the "public interest" standard enables the agency to consider a range of impacts "including climate change considerations and global energy security").