NEPA Review of Fossil Fuels Projects—Principles for Applying a "Climate Test" for New Production and Infrastructure

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SUMMARY: The obligation of government decisionmakers to disclose the lifecycle greenhouse gas emissions ("GHGs") of proposed fossil fuel production and infrastructure projects when assessing them under the National Environmental Policy Act ("NEPA") and parallel state laws, is increasingly being enforced by the courts. Agencies that once eschewed the task as unnecessary or impossible are now making efforts to embrace it. This is a positive development, as the lifecycle emissions associated with fossil fuel production and infrastructure projects are crucial considerations that should be informed by a fair and accurate NEPA review.

Even so, problems have emerged that undercut the value of these analyses. Agencies commonly compare a proposed project's lifecycle GHGs to hypothetical emissions under a counterfactual under which the project is not developed–with the focus on the "net" difference between the two scenarios. Alternatively, this approach is framed a "substitution" or "displacement" analysis, focusing on how much of the new fuel will simply displace some other similar fuel, leading to little change in the total amount of fuel used. While the use of a counterfactual scenario is not in itself necessarily a problem, the way that such analyses have been applied in NEPA reviews of individual projects has distorted the overall picture of a project's contribution to climate change.

There are now many examples of agencies assuming that if a project is not approved, some other entity would produce, transport, or consume all or nearly all of the fossil fuels that would be produced or transported by the project under review. This results in a poorly supported and likely incorrect finding that the project has little or no impact on long term GHG emissions–or even a net benefit if it displaces a less GHG-intensive source of fuel. This paper highlights the problems with this kind of analysis and proposes a refined approach that focuses on a project's known emissions and places emissions analysis in the context of the need to rapidly phase out fossil fuels to very low levels to meet internationally agreed climate goals.

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Introduction

Many fossil fuel production and infrastructure projects–for example, major new oil or gas fields, coal mines, and the transport and handling infrastructure used to bring those resources to market–need to perform analysis of their potential greenhouse gas emissions, as required by NEPA and similar state laws.[1] This paper concerns improving the current practice of assessing GHG emissions associated with such projects.[2]

The discussion below begins with a brief review of some key NEPA principles, then turns to a review of the flaws that can arise when performing a GHG analysis for an individual fossil fuel project. We then propose three principles for completing a NEPA-compliant fossil fuel project analysis that will come closer to achieving NEPA's goals, address the current problems, and provide more useful, transparent, and accurate information to the public and decision-makers. In brief, our proposed principles are intended to help guide agencies to clearly state the relatively uncontroversial lifecycle emissions associated with each project, while also assessing the extent to which proposed projects align with agreed climate goals and commitments.[3]

NEPA Standards

NEPA is a procedural statute that serves important substantive goals. It ensures that federal agencies will consider "detailed information concerning significant environmental impacts" when deciding whether to move ahead with government permitted or funded actions.[4] Making an agency disclose key environmental impacts and tradeoffs "gives the public the assurance that the agency has indeed considered environmental concerns."[5] And the ultimate objective is not just better information–it is better decisions: by infusing environmental information into government decisions, NEPA promotes sounder decision-making.[6] These goals

1 For additional background, there is abundant scholarship on the topic. *See, e.g.,* Michael Burger & Jessica Wentz, *Evaluating the Effects of Fossil Fuel Supply Projects on Greenhouse Gas Emissions and Climate Change Under NEPA,* 44 Wm. & Mary Env't L. & Pol'y Rev. 423 (2020); Michael Burger & Jessica Wenz, *Downstream and Upstream Greenhouse Gas Emissions; The Proper Scope of NEPA Review,* 41 Harv. Env't Rev. 109 (2017); James Coleman, *Beyond the Pipeline Wars: Reforming Environmental Assessment of Energy Transport Infrastructure,* 2018 Utah L. Rev. 119 (2018).

2 By contrast, we do not explicitly envision here this process applying to other types of infrastructure (such as highways or bridges, or other types of industrial activities such as steel or cement making) that handle fossil fuels only incidentally, even as it is conceivable that our proposed framework could, with modifications, be adapted to other uses. Nor do we address more programmatic assessments, such as the comparison of different policy options. We leave such other potential applications to future work.

3 By lifecycle GHG emissions here, we mean the emissions released along the life cycle, or value chain, of fossil fuels, from the "upstream" point where the fuels are extracted to the "downstream" point at which they are combusted or otherwise reach a final end state.

4 *Robertson v. Methow Valley Citizens Council,* 490 U.S. 332, 348 (1989) (citing 42 U.S.C. § 4331).

5 *Id.*

6 40 C.F.R. § 1500.1 (2019). The Trump administration comprehensively rewrote NEPA's implementing regulations in 2020. *See* Update to the Regulations Implementing the Procedural Provisions of the National Environmental Policy Act, 85 Fed. Reg. 43,304 (July 16, 2020). However, the current administration is engaged in a process to restore the long-standing previous regulations. *See, e.g.,* Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis, 86 Fed. Reg. 7,037 (Jan. 25, 2021); National Environmental Policy Act Implementing

should always be considered the north star when assessing agency compliance with NEPA. Any NEPA analysis that masks key information on project impacts from decisionmakers and the public is running afoul of the primary point of the law. In short, it is crucial that assessments of GHGs be accurate and transparent.

The tool for accomplishing these objectives is an environmental impact statement, or EIS. Federal agencies are required to prepare an EIS for major Federal actions significantly affecting the quality of the human environment.[7] If a project will have "significant" environmental impacts, an EIS is mandatory.[8] Agencies frequently use a streamlined initial assessment, known as an environmental assessment, or EA, to determine whether a project's impacts are significant enough to warrant an EIS.[9]

Whether a project has "significant" environmental impacts depends on a weighing of both "context" and "intensity."[10] Context looks to the "setting and surrounding circumstances."[11] As to intensity, NEPA's regulations list several factors that can trigger a finding of significance, including: "[u]nique characteristics of the geographic area such as proximity to historic or cultural resources," the degree to which the effects are "likely to be highly controversial;" and the degree to which the effects are "highly uncertain or involve unique or unknown risks."[12] The "highly controversial" intensity factor refers to "a substantial dispute . . . as to the size, nature, or effect of the major federal action," rather that public opposition.[13] The principles discussed in this paper apply equally to the question of whether GHG emissions are "significant" enough to trigger an EIS, as well as how to analyze them in an EIS once one has been triggered.

Not long ago, many agencies side-stepped accounting for upstream and downstream GHG emissions associated with the fossil fuel-related projects they authorized. There were a variety of reasons given for avoiding such accounting: agencies claimed that indirect GHG emissions that occurred outside the project location were too speculative, simply continued the status quo, were not within the agency's regulatory control, were too uncertain in light of unknown end uses, or were too small to count in light of global emissions. Over time, these justifications have been mostly rejected by the courts.[14] Today, the principle that agencies need to grapple with the upstream and downstream emissions impacts of pipelines, terminals, and production appears

Regulations Revisions, 86 Fed. Reg. 55,757 (Oct. 7, 2021). Because the 2020 modifications are the subject of ongoing regulatory process as well as multiple legal challenges, and because the 1978 regulations form the basis for most NEPA caselaw, this paper primarily cites to the 1978 regulations.

7 42 U.S.C. § 4332(2)(C); *Sierra Club v. Van Antwerp,* 661 F.3d 1147, 1153 (D.C. Cir. 2011).

8 *Sierra Club v. Peterson,* 717 F.2d 1409, 1415 (D.C. Cir. 1983) (emphasis in original); *see also Nat'l Audubon Soc'y v. Hoffman,* 132 F.3d 7, 13 (2nd Cir. 1997) ("When the determination that a significant impact will or will not result from the proposed action is a close call, an EIS should be prepared.").

9 40 C.F.R. § 1501.4.

10 40 C.F.R. § 1508.27.

11 *Am. Rivers v. FERC,* 895 F.3d 32, 49 (D.C. Cir. 2018).

12 40 C.F.R. § 1508.27(b).

13 *Town of Cave Creek v. FAA,* 325 F.3d 320, 331 (D.C. Cir. 2003).

14 *See* Burger & Wentz (2016), *supra* n.1, at V.B.I.

to be mostly well-settled.[15] Of course, a few agencies continue to resist this imperative, and a few courts may uphold such refusals when challenged. But overall, the trend is that agencies are accepting that such analysis is required. Today, the question is not as much whether these kind of lifecycle emissions should be counted, but how to do it.

Some additional context may be helpful. NEPA documents–including both EISs and EAs–are required to be as scientifically accurate as possible. An EIS must provide a "full and fair discussion of significant environmental impacts."[16] The environmental information "must be of high quality," and "accurate scientific analysis" is "essential to implementing NEPA."[17] NEPA requires an agency to ensure "scientific integrity" in the analyses contained in an EIS.[18] As to uncertainty, courts have been clear that agencies cannot ignore categories of impacts just because they cannot be estimated with precision, and that some degree of "reasonable forecasting" is necessary.[19] If obtaining "incomplete information" is essential to a choice of alternatives, that is required as long as the costs are not "exorbitant."[20] At the same time, it is crucial to highlight uncertainty where it exists: an agency cannot present certain and well-supported estimates as equal in kind to speculative ones–to do so would be "arbitrary and capricious" under federal law.[21] Indeed, significant "uncertainty" associated with an impact is grounds for triggering an EIS in the first place.[22]

Another key principle is that agency decisions need to be contextualized in the framework of existing plans, standards, and legal requirements, which includes not just domestic policies but also international treaties and commitments. This principle shows up in the regulatory definition of "significance," which triggers the duty to prepare an EIS.[23] The question of "whether the action threatens a violation of Federal, State, or local law or requirements to protect the environment" is a key consideration in evaluating whether an

15 *See, e.g., Sierra Club v. FERC,* 867 F.3d 1357, 1371–75 (D.C. Cir. 2017) (EIS for Sabal Trail gas pipeline invalid because it failed to consider impacts of burning the transported gas in power plants); *WildEarth Guardians v. Zinke,* 368 F. Supp. 3d 41, 69 (D.D.C. 2019) (rejecting NEPA analysis that failed to quantify GHG emissions from oil and gas development projects); *Mont. Env't Info. Ctr. v. U.S. Off. of Surface Mining,* 274 F. Supp. 3d 1074, 1098 (D. Mont. 2017) (agency acted arbitrarily when it quantified emissions from coal mine expansion, but found "no effect" on global climate "because other coal would be burned in its stead[.]").

16 40 C.F.R. § 1502.1.

17 40 C.F.R. § 1500.1(b).

18 40 C.F.R. § 1502.24.

19 *Scientists' Inst. for Pub. Info., Inc. v. Atomic Energy Comm'n,* 481 F.2d 1079, 1092 (D.C. Cir. 1973) ("an agency need not foresee the unforeseeable, but … [r]easonable forecasting and speculation is … implicit in NEPA, and we must reject any attempt by agencies to shirk their responsibilities under NEPA by labeling any and all discussion of future environmental effects as 'crystal ball inquiry'.").

20 40 C.F.R. § 1502.22.

21 *See, e.g., Nat'l Parks Conservation Ass'n v. Babbitt,* 241 F.3d 722 (9th Cir. 2001); *Lands Council v. Powell,* 395 F.3d 1019 (9th Cir. 2005) (failure to disclose shortcomings of the analysis); *N.C. Wildlife Fed'n v. N.C. Dep't of Transp.,* 677 F.3d 596 (4th Cir. 2012) ("Clarity is at a premium in NEPA" and NEPA is violated when agency "fail[s] to disclose incomplete info" and make "up-front disclosures").

22 40 C.F.R. § 1508.27(b)(5); *Ocean Advocs. v. U.S. Army Corps of Eng'rs,* 402 F.3d 846, 870 (9th Cir. 2005) ("Where the environmental effects of a proposed action are highly uncertain or involve unique or unknown risks, an agency must prepare an EIS.")

23 40 C.F.R. § 1508.27(b)(10).

EIS is needed.[24] Such laws, plans, and obligations must also be assessed in an EIS, which calls for a description of whether a proposed project "conflicts" with Federal, state, Tribal or local "policies," among other things.[25] Even without this specific regulatory directive, it is unlawful under the Administrative Procedure Act for an agency to "ignore" a key factor bearing on an agency's decision–and a decision that collides with a law, treaty, or international obligation is surely a key factor that agencies cannot ignore.[26] Relevant here are federal government policies which place the climate crisis "at the center of United States foreign policy and national security,"[27] and that commit the nation to a reduction of GHGs of 50–52% by 2030.[28]

A final principle that bears mentioning is the standard for utilizing mitigation to offset the impacts of a project. If mitigation can be found that would reduce impacts to the point of insignificance, NEPA does not require an EIS. However, the mitigation must be sufficiently clear and certain to occur.[29] When an EIS is triggered, an agency's decision must ensure that mitigation is monitored and enforced.[30] Courts require mitigation to be "reasonably complete" in order to "properly evaluate the severity of the adverse effects" of a proposed project prior to making a final decision.[31] Taken together, these requirements stand for the principle that if the adverse impacts of a project are going to be offset by some other action, they need to be fully disclosed and reasonably certain. The principle is only indirectly applicable here, since GHG analyses that focus on fuel displacement do not explicitly label these putative offsets as "mitigation." However, the mitigation standards point to an important underlying NEPA principle: if an agency is relying on some other action to offset a project's impacts, it needs to be well defined and reasonably certain to occur. Holding that standard up to the GHG emissions of speculative displacement effects highlights the problem with such an approach.

Current Displacement or "Net Emissions" Analysis

In their most straightforward form, lifecycle GHG emissions can be characterized as the emissions released along the entire life cycle, or value chain, of the fossil fuel produced or handled– from production to use, which is typically but not necessarily combustion. For example, the most substantial sources of GHG emissions associated

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24 *Id.*

25 40 C.F.R. § 1502.16; *Openlands v. U.S. Dep't of Transp.*, 124 F.Supp.3d 796, 808 (N.D. Ill. 2015) (faulting EIS for failing to consider "[p]ossible conflicts between the proposed action and the objectives of … regional … land use plans,").

26 *See, e.g., Standing Rock Sioux Tribe v. U.S. Army Corps of Eng'rs,* 985 F.3d 1032, 1049, 450 (D.C. Cir. 2021) (agency failed to explain its decision to "ignore" key factor, rendering NEPA decision unlawful).

27 Tackling the Climate Crisis at Home and Abroad, 86 Fed. Reg. 7619 (Feb. 1., 2021).

28 The pledge to reduce "net greenhouse gas emissions by 50-52 percent below 2005 levels in 2030" formed the core of the United States "Nationally Determined Contribution" submitted to the United Nations Framework Convention on Climate Change (UNFCCC) in line with Article 4 of the UNFCCC's Paris Agreement. *See* https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/United%20States%20of%20America%20First/United%20States%20NDC%20April%2021%202021%20Final.pdf.

29 Final Guidance for Federal Departments and Agencies on the Appropriate Use of Mitigation and Monitoring and Clarifying the Appropriate Use of Mitigated Findings of No Significant Impact, 76 Fed. Reg. 3843 (Jan. 21, 2011).

30 40 C.F.R. § 1505.2; § 1502.3 (mitigation "shall" be implemented); § 1502.16(h) (EIS must describe mitigation measures).

31 *Robertson,* 490 U.S. at 352. Merely listing possible mitigation measures is insufficient to comply with NEPA. *Neighbors of Cuddy Mountain v. U.S. Forest Serv.,* 137 F.3d 1372, 1380 (9th Cir.1998).

with an oil pipeline would be the emissions from burning the oil handled by the pipeline and the emissions associated with extracting and processing the oil fed into the pipeline. Quantifying these emissions is common practice and involves application of generally accepted standards.[32]

Problems have arisen, however, when agencies and project proponents attempt to compare these emissions to a putative "no-action" scenario, in order to estimate what other emissions would be displaced by the project under review. There have been several examples of lifecycle GHG analyses that rely on a flawed displacement analysis, or net comparative approach, to find that major fossil fuel investments result in no, or even negative, net GHG emissions. These analyses take varying approaches. Some compare a project's lifecycle GHGs to a no action alternative to arrive at a "net" GHG conclusion. Others build this comparison directly into the assessment of project emissions, by assessing how the project would "displace" other fuels from other sources. The conclusions of this paper are applicable to either approach.

To be sure, the concept of displacement or substitution in global energy markets is not a novel one, nor are we critiquing all potential applications.[33] Because fossil fuels are traded in regional, even global, markets, if a particular source of fossil fuel is not made available, some other fuel, likely from a higher cost source, is likely to fill in to supply some portion of that need, at least in the shorter term. Still, to the extent that substitution leads to slightly higher prices overall, that would also mean lower consumption, and hence, in most cases, reduced GHGs. In oil markets, studies appear to converge on an estimate of around 50% displacement over the longer term, but there is a wide potential range.[34] But this forecast gets increasingly muddled the further out one looks, not just for oil, but for other fossil fuels as well: for example, while some analysts conclude that expanding gas production is likely to displace some amount of dirtier coal-fired generation in the near- to medium-term, it becomes increasingly likely in the future that it would instead be displacing low- or near-zero-GHG alternatives such as renewables.[35]

Agencies' initial forays into applying substitution analysis for individual projects offered little more than a bare assertion that the fuel handled by a proposed project substituted, 1-for-1, for another fuel. The potential for significant GHGs was dismissed on an unsupported assumption of "perfect substitution." Courts were not receptive.[36] To survive judicial review, it seems

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32 For example, in the recent Line 5 pipeline replacement project case before the Michigan Public Service Commission (Case No. U-20763), the estimate of the lifecycle, upstream and downstream GHG emissions associated with the crude oil and NGL presented by the expert (Peter Erickson) for the environmental plaintiffs was not contested by the pipeline proponent (Enbridge) or by State of Michigan staff. Of course, it is not our point that quantification of GHG emissions is free of any uncertainty. For example, assessing the rate of methane loss "upstream" in gas projects has been a point of contention in some projects. However, the uncertainty around such estimates is relatively modest and can be addressed through appropriate disclosure or use of a range of outcomes.

33 *Ctr. for Sustainable Econ. v. Jewell,* 779 F.3d 588, 603 (D.C. Cir. 2015) (accepting basic principle that if oil and gas are not extracted from federal lands, "American energy users would turn to other sources to meet their energy needs.").

34 Rachel Rothschild and Max Sarinsky, *Toward Rationality in Oil and Gas Leasing* (Institute for Policy Integrity, Aug. 2021), at 14.

35 Jayni Hein et al, *Pipeline Approvals and Greenhouse Gas Emissions* (Institute for Policy Integrity, April 2019), at 38.

36 *See, e.g., WildEarth Guardians v. U.S. Bureau of Land Mgmt.,* 870 F.3d 1222, 1234–38 (10th Cir. 2017) (rejecting agency's "perfect substitution" argument); *High Country Conservation Advocs. v. U.S. Forest Serv.,* 52 F. Supp. 3d 1174, 1197–98

clear by now that agencies need to show some analytical support before relying on a net displacement conclusion.

More recently, agencies have sought to provide the missing analytical support through quantitative models or expert analysis. In some cases, these efforts foundered in court because the modeling ignored key considerations. For example, there have now been a handful of decisions striking down GHG estimates for offshore leasing sales that explicitly estimate domestic fuel displacement–and find no significant GHG impacts due to it–but that inexplicably declined to include impacts on foreign oil consumption and associated emissions.[37] Notably, these courts had no problem with the concept of relying on a net displacement analysis to assess GHGs from oil leasing decisions.[38] Rather, the problem was that their displacement analysis was incomplete.

Other analyses have survived judicial review despite obvious shortcomings. In one state case, project opponents appealed a state-NEPA EIS of lifecycle GHG emissions for a liquified natural gas ("LNG") terminal in Washington state; the site would be primarily used for marine fuel, as well as other uses like truck fuel.[39] The EIS reached a conclusion that 100% of the terminal's LNG used for marine fuel would displace conventional marine gas fuels. And because it assumed conventional marine gas had higher lifecycle GHG emissions than LNG, the EIS concluded that the LNG project would represent a net reduction in GHG emissions. The assumption that the project would displace conventional marine fuel was carried forward for the project's entire lifespan of decades, even as LNG already is and will be competing with many other fuels besides conventional fossil fuels over that timeframe. Appellants provided extensive evidence that this 1-for-1 displacement analysis was flawed, for example, by highlighting International Maritime Organization decarbonization goals, maritime industry decarbonization efforts, and emerging low-carbon marine technologies already in use and likely to be increasingly available over time.[40] Similarly, the EIS assumed that LNG would displace conventional diesel fuel for trucks on a 1-for-1 basis over the project's entire lifespan, even though electric trucks are already on the cusp of commercial viability and despite enacted state policies requiring adoption of zero-emission trucks. Despite this evidence, a state hearings board found that the EIS did not violate a deferential "rule of reason."[41]

In another example that was never tested judicially, the state of Washington conducted a lifecycle GHG analysis of a proposed coal export terminal that would have exported 50 million tons of Powder River basin coal annually overseas. The state was among the first to seek to tease out

(D. Colo. 2014) (same).

37 *Ctr. for Biological Diversity v. Bernhardt,* 982 F.3d 723, 740 (9th Cir. 2020) (agency "cannot ignore basic economics principles and state—without citations or discussion—that the impact of the Liberty project on foreign oil consumption will be negligible."); *Friends of the Earth v. Haaland,* 2022 WL 254526, at *12 (D.D.C. Jan. 27, 2022) (exclusion of foreign oil consumption from lifecycle GHG analysis was arbitrary and capricious).

38 Of course, the concept of displacement was not challenged, so the court did not specifically rule that is was acceptable either.

39 *Advocs. for a Cleaner Tacoma v. Puget Sound Clean Air Agency,* 2021 WL 6195873 (Washington Pollution Control Hearings Board, Nov. 21, 2021). That case arose under Washington state's version of NEPA, the State Environmental Policy Act, which largely tracks the federal law.

40 *See* Direct Testimony of Peter Erickson, *ACT v. PSCAA,* PCHB No. P19-087c (Mar. 19, 2021) (on file with authors).

41 2021 WL 6195873 at *18. That ruling is currently under appeal.

the market impacts of such a significant volume of international coal exports: how would this volume of coal impact global coal market prices and consumption (i.e., what other sources of coal would be displaced by this new coal versus what additional consumption would result?). The effort ultimately came up with a wide range of potential answers: depending on the assumptions used in the model, the study predicted anywhere from a modest reduction in GHGs to a large increase.[42] The project was ultimately denied by state regulators due to environmental impacts unrelated to GHG impacts.[43]

Shortcomings in Project-Level Displacement Analyses

These examples reveal some serious problems with the "net" or "displacement" approach to GHG analysis in the context of individual fossil fuel projects that render it unsuitable, at least in its current form, for use to meet NEPA's goals of full disclosure and consideration.

First and perhaps foremost, this approach centers either explicitly or implicitly on a comparison between the project and a "no action" alternative reflecting a high-emissions "business as usual" scenario that is neither likely, nor tolerable, nor consistent with stated policies. As the LNG example illustrates, a business-as-usual scenario that shows an energy system continuing its historic reliance on fossil fuels is likely to be misleading. Accordingly, it is rarely appropriate to use a business-as-usual scenario as the focal point of comparison. This is because the transition away from fossil fuels in many sectors of the economy is now well underway, both due to government policies as well as market forces, and so it is misleading to assume that past energy sources will continue unchanged in the absence of a given project.[44] But this is precisely what common displacement models do: the Bureau of Ocean Energy Management MarketSim model, for example, featured in several legal challenges, assumes near constant oil and gas demand domestically for up to 70 years into the future.[45] Such an assumption is less and less plausible over time and can lead to highly misleading conclusions about project impacts.

As the IPCC has found, if the world is to meet the agreed-upon goal of limiting global warming to "well below 2°C" while "pursuing efforts" to limit warming to 1.5°C,[46] it needs to sharply ramp down the consumption and, by extension,

42 Final EIS for Proposed Millennium Bulk Terminals–Longview, Cowlitz Cnty. & Wash. State Dep't of Ecology (Apr. 28, 2017), https://apps.ecology.wa.gov/publications/documents/1706013.pdf.

43 Wash. State Dep't of Ecology Order # 15417 Den. Section 401 Water Quality Permit for Millennium Bulk Terminals–Longview (Sept. 26, 2017), https://ecology.wa.gov/DOE/files/83/8349469b-a94f-492b-acca-d8277e1ad237.pdf.

44 A growing body of research attempts to estimate the likelihood of different future energy pathways. Though the precise evolution of the future can never be known with certainty, some pathways—namely, the business-as-usual, fossil-fuel-based energy system, is increasingly being ruled out. *See, e.g.,* Moore, F. C. et al., *Determinants of Emissions Pathways in the Coupled Climate–Social System,* Nature, 1–9 (2022), which finds (at pg. 2) "a high likelihood of accelerating emissions reductions over the twenty-first century, moving the world decisively away from a no-policy, business-as-usual baseline."

45 *See* U.S. Bureau of Land Mgmt., GMT2 SEIS Appendix H, https://eplanning.blm.gov/public_projects/nepa/65817/127980/155727/Appendix_H-_BOEM_Greenhouse_Gas_Lifecycle_Model_Methodology.pdf (This analysis uses a projection of near constant demand over the next 40–70 years using the 2016 AEO Reference Case, for which EIA does not assume any future changes in laws or policies other than what is incorporated in existing laws and policies."). As one paper put it, MarketSim "applies implausible inputs and produces unreliable results." Hein, *supra* n. 34, at 10.

46 This language is from the UNFCCC's Paris Agreement adopted in 2015, https://unfccc.int/resource/docs/2015/cop21/eng/10a01.pdf.

transportation and production of fossil fuels to very low levels.[47] Similarly, in their 1.5°C–aligned Net Zero Scenario, the International Energy Agency recently found that there was no need for any new oil or gas developments, as of the end of 2021.[48] Acting on earlier versions of similar findings, almost every nation in the world has pledged in one form or another to commence down that path, for example, by committing to both global and country-specific GHG reductions under the Paris Agreement.[49] Centering an EIS analysis on the assumption that "if we don't produce or move this fossil fuel, someone else will" ignores both these pledges and the science that motivated them.[50] This approach pretends as if the nation, and other nations, have not made a commitment to stop global warming, a commitment that, regardless of whether the temperature limit is 1.5°C or instead "well below 2°C", will require reaching zero net carbon dioxide emissions later this century–and therefore a sharp ramp-down in fossil fuel use–within the lifespan of most major projects.[51]

As noted above, both the duty to prepare an EIS, and the GHG analysis within an EIS, need to explicitly account for relevant laws, plans, and treaties. NEPA documents also need to account for the key relevant science. Conventional net/displacement approaches to GHG analysis, when conducted relative to business-as-usual, assume that our commitments to these laws and treaties, and hence to sharp global reductions in emissions, will not be implemented. Such an approach exemplifies "arbitrary and capricious" thinking that violates NEPA and should not survive judicial review.

This critique hardly breaks new ground. In fact, it is hard to find any other analytical context in which known environmental or health harm is dismissed on the theory that "if we don't do it, someone else will." For example, cutting down

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47 *See, e.g.,* Rogelj, J. et al. Chapter 2: Mitigation Pathways Compatible with 1.5°C in the Context of Sustainable Development, *Global Warming of 1.5 °C: An IPCC Special Report on the Impacts of Global Warming of 1.5°C Above Pre-Industrial Levels and Related Global Greenhouse Gas Emission Pathways, in the Context of Strengthening the Global Response to the Threat of Climate Change, Sustainable Development, and Efforts to Eradicate Poverty* (2018). The scenarios produced for Rogelj et al. were further analyzed in Stockholm Environment Institute et al., *The Production Gap; The Discrepancy Between Countries Planned Fossil Fuel Production and Global Production Levels Consistent with Limiting Warming to 1.5 C or 2 C* (2020). The report noted that the world must decrease fossil fuel production by around 6% a year between 2020 and 2030 to limit warming to 1.5°C. Instead, most nations are planning to increase production. See also the IPCC's most recent report, which reaches very similar conclusions as Rogelj et al (2018): Riahi, K., R. Schaeffer, et al., 2022: Mitigation pathways compatible with long-term goals. *In IPCC, 2022: Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* [P.R. Shukla, J. Skea, R. et al., (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA.

48 IEA, *World Energy Outlook* 2021, IEA Publications (2021), https://www.iea.org/reports/world-energy-outlook-2021.

49 For a discussion of how the science motivated the 2°C goal of the Paris Agreement and its predecessor agreements, see: van Beek, L., Hajer, M., Pelzer, P., van Vuuren, D. & Cassen, C. Anticipating futures through models: the rise of Integrated Assessment Modelling in the climate science-policy interface since 1970. *Global Environmental Change* 65, 102191 (2020).

50 *See* Coleman, *supra* n.1, at 161 ("nearly any fossil fuel export can be justified if it is compared exclusively to a dirtier competitor").

51 The atmospheric science is unyielding on this point, since limiting warming to *any* temperature limit (even above 2°C) will require reaching zero CO_2 emissions globally eventually. For example, a classic paper on atmospheric physics, finds that "to hold climate constant at a given global temperature requires near-zero future carbon emissions. Our results suggest that future anthropogenic emissions would need to be eliminated in order to stabilize global-mean temperatures." Matthews, H. D. & Caldeira, K. *Stabilizing Climate Requires Near-Zero Emissions,* Geophysical Research Letters 35, (2008). This means that *any* continued net CO_2 emissions increases warming.

trees for lumber has environmental impacts–habitat modification, water pollution, species disturbance, and the like. It is also perhaps true that if a particular timber sale doesn't happen, demand for timber will be satisfied from some other source, which would again presumably have its own set of adverse environmental impacts. Yet NEPA documents do not dismiss or offset a timber sale's environmental harms on the theory that they will probably occur anyway through some other source. Government decisionmakers have agency over, and responsibility for, impacts that will be caused by their decisions. NEPA requires them to assess and be accountable for those impacts. That responsibility has never been surrendered just because someone else may cause the same harm instead.[52]

This highlights another problem with this approach, which is the asymmetry of the comparison. On the one hand, it is relatively straightforward to calculate the lifecycle GHGs of a fossil fuel product, by tallying up the GHG emissions that occur at each stage of a fossil fuel's extraction, processing, refining, transport, and end-use.[53] We emphasize "relatively" because, of course, lifecycle GHG analysis does require assumptions, some of which are debatable–for example, the rate of methane loss associated with upstream oil and gas production. The most time-consuming part is often the calculation of emissions associated with constructing the proposed fossil fuel project, which are usually relatively minor compared to the emissions associated with combusting the fuel itself.[54] As to the end-use GHG emissions of, say, a barrel of crude oil or a gallon of LNG, that is mostly straight-forward carbon accounting, well documented in IPCC, US EPA, and US EIA sources,[55] and which can be supplemented by the scientific literature on the upstream sources of emissions associated with each unit of fuel handled.[56] When an agency authorizes a project that will produce, store, or transport a given volume of fossil fuel, it is possible to estimate with a fairly high degree of accuracy a reasonable range of what the GHG emissions of consuming that fuel will be.

52 Burger & Wenz (2020), *supra* n.1, at 504 (normally under NEPA, "agencies focus on the actual impacts of the proposal under review without attempting to project the possible impacts of other activities that may occur if the proposal is not implemented.")

53 Our definition of lifecycle here is therefore similar to what has been called an *attributional* lifecycle analysis, and for which methods are generally non-controversial. By contrast, methods for *consequential* lifecycle analysis are subject to more ongoing debate, including around the market effects of introducing a new source of energy demand or supply. Such consequential lifecycle analysis is an important field of study and with potentially useful applications, and this paper should not be interpreted to mean that they serve no purpose. Instead, we argue only that a simpler, attributional-type analysis is more appropriate for NEPA analysis of individual fossil fuel production and transportation projects.

54 For example, one of the authors of this paper calculated that the GHG emissions associated with a pipeline replacement project were 1,000 times less than the annual emissions associated with the oil carried by the project. Neither of the calculations were disputed by the pipeline proponents or its expert witnesses, even as the net, incremental emissions of the project were contested. Revised Testimony of Peter Erickson on Behalf of Environmental Law and Policy Center and Michigan Climate Action Network, MPSC Case No. U-20763 (Jan. 18, 2022), https://mi-psc.force.com/sfc/servlet.shepherd/version/download/0688y000001m4PRAAY.

55 *See,* e.g., carbon contents and energy contents of fossil fuels in ANNEX 2 Methodology and Data for Estimating CO_2 Emissions from Fossil Fuel Combustion, published annually as part of the EPA's *Inventory of U.S. Greenhouse Gas Emissions and Sinks*.

56 For example, for oil, the Oil-Climate Index (http://oci.carnegieendowment.org/#total-emissions), or related scientific publications (e.g., Masnadi, M. S. et al., *Global Carbon Intensity of Crude Oil Production,* Science, 361(6405), 851–53 (2018), https://doi.org/10.1126/science.aar6859) can be used to estimate the upstream and midstream emissions associated with oil.

Estimating the counterfactual for a single project—what will happen if the project is not approved (and, relatedly, the net, incremental GHG emissions of the project relative to that counterfactual)—is an entirely different exercise.[57] Coal, oil, and gas are produced, transported, and consumed in highly complex globalized markets. How a single new project would change those dynamics at the margin is subject to numerous market and other forces. Assessing the net emissions relative to a counterfactual involves an added layer of uncertainty and speculation that though theoretically possible (such approaches and models do exist), requires extremely careful handling in order to provide clear and useful information instead of misleading conclusions.[58] Most worryingly, the range of uncertainty leaves open the possibility that conclusions can be manipulated by project proponents to reach a desired result.[59]

Importantly, the uncertainty in what would otherwise happen without the proposed project becomes more pronounced as time passes. For example, in the case of a new oil pipeline, whereas it may be possible that a similar amount of crude oil would continue to move by train or other pipelines in the short term if the pipeline isn't authorized, it is considerably more difficult to say what might be happening in ten, twenty, or fifty years—well within the expected lifetime of a major infrastructure project. Notably, given the rapid rise in electric vehicles and other market developments that threaten to cut into oil demand, as well as government commitments to reduce GHG emissions, the likelihood that the "no action" scenario's energy system is no longer dominated by oil increases over time.

Once a project is fully built and operational, the facts can show that the business-as-usual no-action estimate was flawed, but of course by then it is too late to revise the analysis, let alone to factor that into permitting decisions about the project. For example, one aspect of the NEPA analysis for the heavily-litigated Dakota Access Pipeline escaped much scrutiny: the environmental assessment asserted that that construction of the pipeline (with the capacity to carry more than half of the region's crude oil production) would have no impact on the volume of crude oil produced or consumed. Instead, it claimed that the pipeline would simply displace other forms of oil transportation, primarily rail and truck. Events on the ground cast substantial doubt on the claim after the fact. After the pipeline went online and provided a significantly cheaper mode of transportation, North Dakota crude production reached all-time highs within months.[60] Later, industry representatives filed sworn statements

57 We are hardly the first ones to point this out. *See,* e.g., Burger & Wentz (2020), *supra* n.1, at 451 ("While this approach seems reasonable in theory, there are potential problems in practice."). Prof. Coleman's piece argues that "it is nearly impossible to draw conclusions about how a single energy transport project will affect global energy markets," and that it is "useless and unwise" to try to consider a single project's impact on downstream consumption of fossil fuels. Coleman, *supra* n.1, at 125, 165.

58 Such a comparison is also subject to basic information asymmetry in the sense that the project developers may have access to more proprietary information about the possible near-term market outcomes without the project than do regulators or the public, even as they have an inherent conflict of interest in how they use and portray that information in ways that support the development of the project.

59 NEPA's conflict of interest provisions are notoriously weak and many agencies delegate responsibility for drafting EISs and EAs to the project proponent's preferred contractor. 40 C.F.R. § 1506.5(c). The predictable result is EISs that don't present a full and fair description of impacts.

60 For data and analysis of the effect of DAPL on Bakken oil production see IEFFA, *Has the Bakken Peaked?* (Fig. 2 shows production spiking upwards shortly after DAPL came online in 2017), https://ieefa.org/wp-content/uploads/2021/11/Has-the-Bakken-Peaked_November-2021.pdf. *See also* Matt Hagerty, BTU Analytics, *Implications*

in federal court claiming that shutting down the pipeline would cause North Dakota production to collapse, confirming the obvious connection between the pipeline's availability and increased oil production. Of course, by the time facts on the ground proved this to be the case, the NEPA process and permitting was long complete.

In short, the scientific community can calculate with reasonable precision the GHG emissions of a fossil fuel project. But estimating what might happen in upstream and downstream energy markets without it is much more speculative. However, conventional displacement analysis, as found in environmental assessments of fossil fuel projects, often uses these very different estimates–comparing a relatively certain project GHG estimate against a more speculative "no action" scenario–as if they are equivalent.[61] When an agency uses such analysis to advance a net emissions finding, it masks this asymmetry and offers false confidence in a speculative conclusion. This defeats the entire purpose of NEPA: to inform decision makers of the result of their actions and assure the public that key concerns have been adequately considered. A project's lifecycle GHG accounting, and the GHG estimate for the counterfactual no action, are not the same and should not be treated as such.

The imbalance between the relative confidence in the GHG estimates from a project and the no-action counterfactual is not the only asymmetry evident in displacement analysis of some major GHG projects. When it comes to assessing a fossil fuel project's environmental harm in the form of GHG emissions, agencies often use displacement analysis to offset or diminish the GHG impacts as described above. When it comes to assessing a project's benefits, however, no such offsets are included. In other words, all of the project's purported economic benefits (tax revenue, employment, federal royalties, etc.) are counted in the project's favor, even though elsewhere in the NEPA analysis, the agency claims that drilling would occur elsewhere without the project.[62] This kind of one-sided approach to assessing economic pros and cons is unlawful under NEPA.[63]

Finally, the conventional displacement or market analysis ignores a central dynamic of the infrastructure equation: the extent to which construction of new fossil fuel infrastructure "locks in" long-term emissions and creates an affirmative barrier to decarbonization efforts. Fossil fuel infrastructure is expensive. Proposed coal terminals on the west coast cost upwards of $300 million each. Oil pipelines and offshore leasing and production ventures can cost hundreds of millions if not billions of dollars. When privately financed, as most projects are, there is going to be extraordinary pressure to fully recoup the investment–which means operating for decades. And knowing this, other actors in the market rely on the long-term continuity of these projects to make their own investments that would be disrupted if the project is stopped before its full lifetime. For example, construction of a crude oil pipeline typically generates construction of other "feeder" pipelines and incentivizes new exploration or production with long-term investment horizons. One of the most complete

of a Potential DAPL Shutdown (Apr. 7, 2021), https://btuanalytics.com/crude-oil-pricing/implications-of-a-potential-dapl-shutdown.

61 Burger & Wentz (2020) at 452 (parameters for substitution models "are highly uncertain and can be manipulated to achieve an intended result").

62 Again, we are not the first to make this observation. Rothschild and Sarinsky, *supra* note 34, at 19.

63 *Hughes River Watershed Conservancy v. Glickman,* 81 F.3d 437, 446–48 (4th Cir. 1996) ("it is essential that the EIS not be based on misleading economic assumptions"); *Sierra Club v. Sigler,* 695 F.2d 957, 979 (5th Cir. 1983) (agency choosing to "trumpet" an action's benefits has a duty to disclose its costs).

studies to look at this question of building out natural gas infrastructure concluded that "increases in global supplies of unconventional natural gas do not discernibly reduce the trajectory of greenhouse gas emissions or climate forcing."[64] That is because new natural gas infrastructure "locks in" natural gas, while locking out decarbonized alternatives, in the future.

As emphasized above, meeting agreed goals of limiting warming to "well below 2°C" or 1.5°C and decarbonizing our economy will require retiring these types of projects early.[65] But multiple factors in our legal and economic systems make such retirement difficult, costly, or even impossible. Authorizing these projects now means future retirement costs that will have to be borne by someone, which in turn likely means an investment in deep political opposition to decarbonization, since project owners will naturally be disinclined to shut down their investments early. However, these analyses make no mention of how difficult or costly it will be to retire projects before their useful lifetimes are up, what the potential impacts of that are, and indeed typically make no mention of the need for early retirement of fossil fuel projects at all.

In sum, the current approach for assessing GHGs from fossil fuel projects is falling short of fulfilling NEPA's goals of full disclosure and consideration. Indeed, it is difficult to find any NEPA document that concludes that GHG emissions from a fossil production or transportation project constitutes a significantly harmful impact.[66] That means that EISs are not being triggered by GHG emissions, and where they are done at all (triggered by other adverse impacts), then GHG emissions are found to not be a concern. This circumvents the entire point of NEPA: to consider and disclose the serious climate implications of major fossil fuel project decisions.

Principles for NEPA-Compliant Fossil Fuel Analysis:

Assessing GHG emissions of fossil fuels on a lifecycle basis, as done by many agencies already and supported by the courts, is a valuable practice that can and should continue. However, the increasingly common practice of assessing GHG impacts on a net basis (or through a substitution estimate) should be abandoned when it comes to individual project decisions. Instead, we propose the following principles to guide future NEPA analysis of major fossil fuel-related project decisions. These principles will result in much more useful information that agencies and the public can use to assess the climate implications of major fossil fuel-related decisions.

a) Focus On the Relatively Non-Controversial Lifecycle Analysis of the Fuels Handled by the Project: Agencies should keep the focus on what they can analyze with established, relatively straightforward approaches–which is the lifecycle emissions of the fuel that would be produced or transported by the project in question. This is the key number: if an agency is, say, authorizing a drilling lease sale that would generate a million barrels of oil a year for 30 years, the NEPA analysis should focus on the GHG emissions of producing and using that oil.

Indeed, FERC recently proposed this approach for inter-state natural gas pipelines under its

64 McJeon, H., Edmonds, J., Bauer, N., Clarke, L., Fisher, B., et al., *Limited Impact on Decadal-Scale Climate Change from Increased Use of Natural Gas,* Nature, 514(7523), 482–85. DOI: 10.1038/nature13837 (2014).

65 Indeed, reaching a 1.5 C target will likely require retirement of existing infrastructure. D. Tong, et al., *Committed Emissions from Existing Energy Infrastructure Jeopardize 1.5 C Target,* 574 Nature 373 (Aug. 2019).

66 Burger & Wentz (2020), at 453.

jurisdiction, calling for a calculation of a project's "GHG emissions resulting from the downstream combustion of transported gas."[67] Similarly, the Department of Interior's Bureau of Land Management calculates the total GHG emissions of fossil fuels when combusted as part of its public information on federal leases.[68]

It is true that NEPA requires some kind of assessment of the "no action" alternative in an EIS.[69] To an extent, this does require an agency to do some "reasonable forecasting" about what will happen without the proposed project. What is not required is a direct 1-for-1 quantitative comparison of the GHG emissions from each, presented with equivalent certainty. That's because, as described above, this kind of forecast is plagued with high uncertainty when it comes to the impact of a single project on complicated global markets with countless variables, and easily manipulated to achieve a desired result. It is sufficient under the circumstances to qualitatively acknowledge that some unknowable amount of GHGs could still be emitted under the no action alternative and, similarly, that some amount of GHG emissions would be displaced, but that number becomes more difficult to predict with each year into the future. By focusing on what we do know, and giving less attention to what is more speculative, this approach comes closer to meeting NEPA's disclosure and consideration objectives.

b) Apply the "Climate Test": Compare to a Baseline that Complies with Climate Policies and Agreements: To the extent a comparison to a no-action scenario is warranted, it should neither focus on a business-as-usual continuation of today's unsustainable conditions, nor a snapshot of today's fuel use patterns. Instead, the baseline (sometimes called a reference scenario) against which a project should be compared to is the one that national and international policymakers have committed to (e.g., under the Paris Agreement), namely, a sharp decarbonization trajectory under which CO_2 emissions drop by nearly half by 2030, and to net zero by 2060.[70] In other words, to comply with NEPA, agencies should explain how a proposed project is consistent with a Paris-compliant GHG trajectory, as well as relevant state and federal climate policies.[71]

This kind of comparison eliminates the central problem of the current approach, under which any project that maintains existing emissions, or reduces them marginally, is found to have inconsequential impacts under NEPA. It should be obvious that a decision to maintain high status-quo GHG emissions for decades is a major adverse impact when emissions must be sharply reduced. In other words, the focus of the comparison is not to a future energy system with high and intolerable levels of climate disruption, but instead to the decarbonized one to which policymakers have committed. Of course, that

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67 *See* FERC Docket No. PL21-3-000, Consideration of Greenhouse Gas Emissions in Natural Gas Infrastructure Project Reviews (Feb. 18, 2022), https://www.ferc.gov/media/pl21-3-000.

68 *See* U.S. Bureau of Land Mgmt., *2020 BLM Specialist Report on Annual Greenhouse Gas Emissions and Climate Trends* (2020), https://www.blm.gov/content/ghg.

69 40 C.F.R. § 1502.14.

70 For this and other emissions pathways associated with 1.5°C and higher temperature targets, see IPCC, 2022: *Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* [P.R. Shukla, J. Skea, *et al.,* (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA

71 For a more detailed example on how to apply such a principle to a specific project, see Peter Erickson & Michael Lazarus, *Towards a Climate Test for Industry: Assessing a Gas-Based Methanol Plant,* Stockholm Env't Inst. (2018).

comparison, too, has some uncertainty: there is not just one path to the 1.5° or 2°C targets, and different paths may have more or less room for new fossil fuel developments or infrastructure. However, as eliminating net CO_2 emissions entirely by around 2060 is a fundamental requirement of holding warming to 1.5°C (assuming no or little temperature "overshoot"), the need to move swiftly away from fossil fuels is clear and, accordingly, can help inform such alternative, low-carbon, 1.5°C–aligned baselines.

A few agencies have begun to hint at an openness to this kind of approach. For example, in a comment letter to the Bureau of Ocean Energy Management on a proposed lease sale, Region 10 EPA commented "EPA recommends that the FEIS assess in detail the extent it which the program is inconsistent with U.S. and global policy to limit GHG emissions and whether resulting production activities would be economically viable in a future where such policies have reduced demand for fossil fuels."[72] Similarly, in its ongoing regulatory process for assessing GHG emissions, the state of Washington called for defining the no action scenario as assessing future conditions under "state and federal GHG reduction limits and international goals approved by the U.S. Government."[73] In denying a key state permit for a methanol plant that would use large volumes of natural gas, Washington state regulators cited the project's high lifecycle emissions and pointed out that they would collide with state policies for the rapid reduction in GHGs.[74] Notably, the letter observed that the project would constitute, by itself, 20% of the state's estimated 2050 carbon budget. Similarly, in closing an area of the Arctic to new offshore oil and gas leasing, the Obama administration cited the possibility that approving leases "would only bring significant new oil and gas resources into the market at a time when the United States and its international partners must be transitioning to alternative energy sources to reduce emissions."[75]

Such a comparison to a low-carbon baseline would not necessarily present an insurmountable barrier to any and all fossil projects. Perhaps the case can be made for a shorter-term project to meet a specific need, e.g., as could be the case for temporarily expanded near-term LNG exports to Europe.[76] Or if an agency has a specific plan for the managed decline of fossil fuel production over the relevant time scale to be consistent with climate commitments, perhaps it can demonstrate that a particular lease sale or piece of infrastructure does have a role in that decarbonization trajectory, or is necessary to provide fuel during the phase out. In contrast, a pipeline that incentivizes new fossil production and/or additional infrastructure investment, and that will likely operate for decades, will have a difficult time being shown to be consistent with a Paris-compliant trajectory. While NEPA itself would not prohibit an agency from choosing an option that collides with international commitments or that would contribute to

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72 Letter on file with authors.

73 WSDOE Draft GAP Rule Conceptual Framework for Informal Review, Wash. State Dep't of Ecology (March 2021), https://ecology.wa.gov/DOE/files/36/36bdb605-225d-4a74-9edd-8bc600714977.pdf.

74 Letter from Laura Watson, Director, Wash. State Dept. of Ecology, to Mark Wilson, Port of Kalama and Murray Godley, Northwest Innovation Works, LLC (Jan. 19. 2021), https://ecology.wa.gov/DOE/files/0b/0b8ab19a-75a9-41db-9c5c-9e5505bb4bfe.pdf.

75 U.S. Dep't of the Interior, *FACT SHEET: President Obama Protects 125 Million Acres of the Arctic Ocean* (2016), https://www.doi.gov/sites/doi.gov/files/uploads/2016_arctic_withdrawal_fact_sheet_for_release.pdf.

76 Erickson, Peter, "The US can provide Europe with LNG while advancing climate goals." https://www.sei.org/perspectives/us-europe-russia-lng-climate/

catastrophic climate instability, it does require agencies to fully disclose these inconsistencies and impacts and explain its decision in light of them.[77] Being forced to explain why it is making a decision that is inconsistent with federal policy can provide political accountability.

c) **Call Out the "Lock-in" Factor:** Finally, the assessment should include an explicit analysis and assessment of the "lock in" risk.[78] Agencies should assess and disclose: what are the mechanisms by which the project in question will trigger other, separate investments in the continued use of fossil fuels in reliance on the project? What are the mechanisms by which the project will create a disincentive to the adoption of alternatives? Can it be repurposed for low-carbon alternatives that may arise in the future? If the project has a long anticipated lifespan, as many do, some of these alternatives may not even exist in commercial form at the time of permitting but are likely to arise in time.[79] Historically, agencies have ignored this factor. To fully disclose the risks and tradeoffs of fossil fuel related decisions, agencies should publicly grapple with this lock-in risk.

Conclusion: The current, common practice of comparing a fossil fuel project's GHG emissions to a business-as-usual counterfactual scenario without the project can be misleading and undermines NEPA's goals of fully assessing and disclosing the GHG implications of major fossil related projects. Instead, to best comply with NEPA's goals of full, accurate, and credible disclosure, assessments of projects' environmental impacts should center their analyses on a more straightforward approach of calculating the lifecycle GHG emissions of the fuels handled by the project. In addition, to the extent that a counterfactual analysis is needed, the focus of such analyses should be on comparing the project to an alternative scenario consistent with climate policies and commitments and that, by extension, helps evaluate whether the project is consistent with a net zero GHG future.

77 40 C.F.R. § 1505.2 (requiring an agency to explain its decision in light of environmental impacts and "essentially considerations of national policy").

78 Peter Erickson, *Assessing the Greenhouse Gas Emissions Impact of New Fossil Fuel Infrastructure,* Stockholm Env't Inst. (2013) ("A fossil fuel project could also lead to long-term 'lock-in' of specific fuels and technologies or 'lock out' of lower-GHG technologies, either because it uses up finite capital or to the extent that it contributes to social or political norms for fossil fuels, building in redundancy of supply that helps to increase investor confidence in the long-term prospects of that fuel, or contributes to economies of scale for fossil fuel processing technologies…").

79 For example, the International Energy Agency and other governmental institutions regularly assess the commercial readiness and expected timelines of emerging, low-carbon technologies.