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VIA EMAIL

Abigail Ross Hopper
Director, Bureau of Ocean Energy Management
1849 C Street, NW
Washington, DC 20240

CC: Dr. James Kendall, BOEM Alaska Region Director

Re: Supplemental Comment on Second Supplemental Environmental Impact Statement for Chukchi Sea Oil and Gas Lease Sale 193, BOEM-2014-0078

Dear Director Hopper:

The Bureau of Ocean Energy Management (BOEM) recently published a Final Second Supplemental Environmental Impact Statement (EIS) for the Administration's reconsideration of Chukchi Sea Oil and Gas Lease Sale 193. The decision whether to affirm or end oil and gas leases in the Chukchi Sea may have profound and lasting implications for the Administration's efforts to address climate change. The Final EIS, however, fails to provide basic information necessary to inform this decision. BOEM analyzes greenhouse gas emissions from "exploration, development, production, and decommissioning" but neglects to provide a full analysis of emissions from the end use of the fossil fuels it predicts could be produced from the lease sale, thereby giving an incomplete assessment of the sale's effects. As we and others described in comments to the Draft Supplemental EIS, BOEM's refusal to analyze these reasonably foreseeable effects violates the National Environmental Policy Act (NEPA) and undermines the principle of informed, transparent decision-making that should underlie the Administration's approach to managing the Arctic Ocean. We urge you to reconsider this approach and to fully analyze and disclose the climate impacts of producing and burning oil from Lease Sale 193.

The urgency and importance of such an analysis of downstream emissions is highlighted by a new study by McGlade & Ekins published in the journal *Nature*.[1] The *Nature* study builds on the scientific consensus that there is a global cumulative atmospheric carbon budget that must be met if we are to have a reasonable chance of limiting global warming to 2° C above the average pre-industrial temperature. Because fossil-fuel reserves contain much more carbon than this budget allows, the vast majority of reserves must remain unburned. The new study quantifies the regional distribution of fossil-fuel reserves and, through modeling a range of scenarios based on least-cost climate policies, identifies which resources will not be burned between 2010 and 2050 if the world efficiently reaches widely accepted climate commitments. The authors find that "all Arctic resources should be classified as unburnable," because development of those resources would be "incommensurate with efforts to limit average global warming to 2° C." As

[1] McGlade, C. & P. Ekins. 2015. The geographical distribution of fossil fuels unused when limiting global warming to 2° C. *Nature*, 517:187-190

this study indicates, production of arctic oil and gas is likely to have significant climate consequences and high-quality information about those consequences ought to be available to decision-makers and the public.

One of the primary reasons BOEM provides for its refusal to undertake the critical analysis of the downstream climate effects of the lease sale is that "the methodologies available for determining the [lease sale's] effect on consumption, including those suggested by commenters, remain too speculative."[2] BOEM does not provide any reasoning for why it considers these methods "too speculative." Research into energy markets and the climate impacts of oil and gas production is a robust area of investigation. Indeed, accounting for the direct, indirect and cumulative climate change impacts of a project is required by NEPA, and such analyses have already been incorporated into NEPA reviews by the Department of State, the Department of Energy, the Bureau of Land Management, and other agencies.[3] Similar methods have been used to craft policy by the California Air Resources Board (CARB).[4] Furthermore, the Council on Environmental Quality (CEQ), in recent draft guidance, also affirmed that NEPA requires agencies to assess downstream emissions of greenhouse gases.[5] Far from being speculative, such analyses provide credible and necessary information to decision makers, allowing them to craft policy to address the threat of climate change.

To encourage the agency to undertake this critical analysis, we set forth below and attached hereto, examples of numerous methods employed by government agencies and independent institutions that could be adapted and utilized by BOEM to assess and disclose the climate impacts of Lease Sale 193. The methods referenced below supplement those already submitted in our comments on the draft EIS. Greenpeace does not necessarily endorse the results or conclusions of these studies, we merely provide reference to them to demonstrate that such methodologies are being developed and used for policy making.

Well-To-Wheels (WTW) Life Cycle Analyses

BOEM could avail itself of standard well-to-wheels (WTW) life cycle analysis (LCA) tools that are readily available to assess the greenhouse gas impacts of oil produced from the Lease Sale 193 sites. Far from being speculative, a WTW analysis is a well-defined tool that is widely used by government agencies for assessing environmental impacts of fuels. Conducting a WTW analysis would provide invaluable information for decision makers. There are a number of

[2] BOEM. 2015. Final Second Supplemental EIS, Appendix E, p. E-26
[3] Sheargold, E. & S. Walavalkar. 2013. *NEPA and Downstream Greenhouse Gas Emissions of U.S. Coal Exports*. New York, NY: Columbia Law School, Center for Climate Change Law.
[4] California Air Resources Board (CARB). 2009. *Staff Report: Initial Statement of Reasons, Proposed Regulation to Implement the Low Carbon Fuel Standard, Volume 1*. Sacramento, CA.
[5] Council on Environmental Quality (CEQ). 2014. *Revised Draft Guidance for Greenhouse Gas Emissions and Climate Change Impacts*. Washington, DC.

software packages and resources available regarding WTW LCA, including:

- Argonne National Laboratory has developed a life cycle analysis software tool known as GREET (Greenhouse gases, Regulated Emissions, and Energy use in Transportation) for conducting well-to-pump (WTP) and well-to-wheels (WTW) analyses.[6]

- Natural Resources Canada has developed a model known as GHGenius to analyze life cycle emissions in the transportation sector.[7]

- The 2009 report from the National Energy Technology Laboratory (NETL) of the U.S. Department of Energy analyzed life cycle GHG emissions from transportation fuels derived from domestic and imported crude oil. The report and its citations contain numerous resources for conducting WTP and WTW analyses.[8]

- Further resources and citations can be found in Lattanzio (2013), a report by the Congressional Research Service (CRS), summarizing various life cycle assessments of the Keystone XL pipeline.[9]

- The OPGEE model at Stanford University is a refinement of earlier LCA methodologies. The scope of OPGEE only extends from "initial exploration to the refinery entrance gate," and is therefore not a full WTW model.[10]

- The Carnegie Endowment recently published an Oil-Climate Index report (2015), providing a full analysis of upstream, midstream and downstream emissions from 30 different test oils.[11] Their models quantified wide differences in the carbon emissions of various fuels.

Market Analysis and Consequential LCA

A WTW analysis is an essential first step in understanding the implications of the lease sale, but additional analyses may also prove important. In its 2007 EIS for Lease Sale 193, BOEM took the position that the end use of oil produced by the lease sale would not result in

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[6] Argonne National Laboratory. 2014. Greenhouse gases, Regulated Emissions, and Energy use in Transportation (GREET) [Computer software]. https://greet.es.anl.gov/greet/index.htm
[7] Natural Resources Canada. GHGenius [Computer software]. http://www.ghgenius.ca/
[8] National Energy Technology Laboratory (NETL). 2009. *An Evaluation of the Extraction, Transport and Refining of Imported Crude Oils and the Impact on Life Cycle Greenhouse Gas Emissions*. U.S. Department of Energy.
[9] Lattanzio, R.K. 2014. *Canadian Oil Sands: Life-Cycle Assessments of Greenhouse Gas Emissions*. Washington, DC: Congressional Research Service.
[10] El-Houjeiri, H.M., A.R. Brandt & J.E. Duffy. 2013. Open-Source LCA Tool for Estimating Greenhouse Gas Emissions from Crude Oil Production Using Field Characteristics. *Environ. Sci. Technol*., 47(11):5998–6006.
[11] Gordon, D., A. Brandt, J. Bergerson & J. Koomey. 2015. *Know Your Oil: Creating a Global Oil-Climate Index*. Washington, DC: Carnegie Endowment for International Peace.

increased greenhouse gas emissions because it would only displace oil that would have been produced elsewhere. BOEM provided no analysis to support this conclusion, and it has since backed away from it, both in the 2011 EIS and the current EIS. As was noted in comments on the draft EIS, BOEM's 2007 conclusion is inconsistent with more recent analyses arguing that increased oil production will indeed lead to increased consumption (and therefore emissions) through the mechanism of price shifts.[12] In any event, a reasonable analysis of market effects would consider the details of energy markets in order to quantify what economic factors might be relevant and the magnitude of their effect on total net emissions. Given the importance of this question for national energy and environmental policy, it is imperative that BOEM conduct a credible analysis of this question, rather than blithely dismissing it with the unsupported assertion that oil produced by the lease sale will not affect consumption, as it did in the 2007 EIS, or by asserting there are no methods for conducting the analysis, as it does now.

Extending traditional LCA by modeling the economic implications of a policy is sometimes referred to as "Consequential LCA" (CLCA) and often makes use of various Integrated Assessment Models (IAMs). Examples of models that have been applied to similar environmental problems include the following:

- The WORLD model, developed by EnSys to analyze the impacts of the Keystone XL pipeline, is probably the most relevant reference for problem at hand, and was discussed in earlier comments on the draft EIS.

- The FRISBEE model "describes future supply and demand of oil and gas through elaborate modeling of oil and gas investments and production" and was employed by Peters et al. (2011) to "construct emission inventories of Arctic shipping and petroleum activities in 2030 and 2050 given estimated sea-ice extents."[13]

- TIAM-UCL is a "global optimisation model that investigates decarbonisation of the global E3 (energy-environment-economy) system."[14]

- The BUEGO model "incorporates the major economic factors (such as production costs, investment rates, the oil price, and elastic response to changes in price) and geological factors (such as decline rates and potential capacity additions) affecting oil production."[15] Both the TIAM-UCL and BUEGO models have been utilized by McGlade & Ekins

[12] Erickson, P. & M. Lazarus. 2014. Impact of the Keystone XL pipeline on global oil markets and greenhouse gas emissions. *Nature Climate Change*, 4:778-781.
[13] Peters, G.P., T. B. Nilssen, L. Lindholt et al. 2011. Future emissions from shipping and petroleum activities in the Arctic. *Atmos. Chem. Phys*., 11:5305-5320.
[14] University College London. TIMES Integrated Assessment Model UCL (TIAM-UCL) [Computer software]. https://www.ucl.ac.uk/energy-models/models/tiam-ucl
[15] University College London. Bottom-Up Economic and Geological Oil field production model (BUEGO) [Computer software]. http://www.ucl.ac.uk/energy-models/models/buego

(2014, 2015) in their analyses of "unburnable" carbon.[16,17]

- REMIND is a "global multi-regional model incorporating the economy, the climate system and a detailed representation of the energy sector. REMIND allows for the analysis of technology options and policy proposals for climate mitigation."[18] Bauer et al. (2013) utilized this model in their analysis of how energy markets will be affected by climate mitigation measures.[19]

- GCAM is a "global, dynamic-recursive, economic equilibrium model" developed by UC Davis and Pacific Northwest National Laboratories (PNNL).[20] This model has been used by Yeh et al. (2013) to assess market mediated effects of the energy system in response to policy changes.[21]

- The World Energy Model (WEM) developed by the International Energy Agency (IEA) models "energy flows by fuel, investment needs and costs, CO_2 emissions and end-user pricing and is calculated for each of the 25 regions modeled."[22]

- The U.S. Energy Information Agency (EIA) maintains the National Energy Modeling System (NEMS) which "projects the production, imports, conversion, consumption, and prices of energy" subject to a wide range of economic and other factors.[23]

Several such analyses have been carried out to better understand the environmental consequences of exports of coal and liquefied natural gas (LNG) from the U.S. to other markets, including:

- Power (2012) provides an economic analysis of how coal exports to China could influence coal markets in Asia, and concludes that coal exports from the U.S. will lead to increased coal consumption and increased GHG emissions.[24] Power & Power (2013)

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[16] McGlade, C. & P. Ekins. 2014. Un-burnable oil: An examination of oil resource utilisation in a decarbonised energy system. *Energy Policy*. 64:102-112.
[17] McGlade & Ekins 2015.
[18] Potsdam Institute for Climate Impact Research. Regionalized Model of Investments and Development (REMIND) [Computer software]. https://www.pik-potsdam.de/research/sustainable-solutions/models/remind
[19] Bauer, N., I. Mouratiadou, G. Luderer, et al. 2013. Global fossil energy markets and climate change mitigation – an analysis with REMIND. *Climate Change*, 1-14.
[20] Joint Global Change Research Institute. Global Change Assessment Model (GCAM) [Computer software]. http://www.globalchange.umd.edu/models/gcam/
[21] Yeh, S., G.S. Mishra, G. Morrison et al. 2013. Long-Term Shifts in Life-Cycle Energy Efficiency and Carbon Intensity. *Environ. Sci. Technol*., 47:2494–2501. http://pubs.acs.org/doi/abs/10.1021/es3029268
[22] International Energy Agency. World Energy Model (WEM) [Computer software]. http://www.worldenergyoutlook.org/weomodel/
[23] U.S. Energy Information Administration (EIA). National Energy Modeling System (NEMS) [Computer software]. http://www.eia.gov/oiaf/aeo/overview/
[24] Power, T.M. 2012. *The Greenhouse Gas Impact of Exporting Coal from the West Coast: An Economic Analysis*. Seattle, WA: Sightline Institute.

updates and extends that analysis.[25]

- Bohnengel et al. (2014) also address the question of coal exports to Asia, and conclude that the net impact on global GHG emissions is dependent on specific details of energy markets.[26] Note also the subsequent responses to this article from other researchers.

- More recently, Abrahams et al. (2015) analyze the impact of LNG exports from the U.S. to Asian and European markets, looking at several scenarios of LNG end uses and displacement of existing fuels.[27]

Due to the importance of understanding indirect land-use changes (ILUC), considerable work has been done applying CLCA to biofuels policy.

- Reviews of the use of CLCA in biofuels can be found in Fargione, Plevin & Hill (2010) and Rajagopal & Zilberman (2013).[28,29]

- To give one highly relevant example, GTAP is a "multiregion, multisector, computable general equilibrium model" that has been widely applied to the biofuels sector.[30] The model has been used by Dandres et al. (2012) to "predict global economic perturbations" caused by European biofuels policy,[31] and by Hertle et al. (2010) to estimate the total impact of U.S. corn ethanol production on global land use and GHG emissions.[32] In their 2009 report, the California Air Resources Board (CARB) utilized both the GTAP and GREET models to analyze California's proposed Low Carbon Fuel Standard (LCFS).[33]

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[25] Power T.M. & D.S. Power. 2013. *The Impact of Powder River Basin Coal Exports on Global Greenhouse Gas Emissions*. San Francisco, CA: The Energy Foundation.
[26] Bohnengel, B., D. Patiño-Echeverri & J. Bergerson. 2014. Environmental Implications of United States Coal Exports: A Comparative Life Cycle Assessment of Future Power System Scenarios. *Environ. Sci. Technol*., 48:9908–9916. http://pubs.acs.org/doi/citedby/10.1021/es5015828
[27] Abrahams, L.S., C. Samaras, W.M. Griffin et al. 2015. Life Cycle Greenhouse Gas Emissions From U.S. Liquefied Natural Gas Exports: Implications for End Uses. *Environ. Sci. Technol*., 49:3237−3245.
[28] Fargione, J.E., R.J. Plevin & J.D. Hill. 2010. The Ecological Impact of Biofuels. *Annual Review of Ecology, Evolution, and Systematics*. 41:351-377
[29] Rajagopal D. & D. Zilberman. 2013. On market-mediated emissions and regulations on life cycle emissions. *Ecological Economics*, 90:77-84.
[30] Hertel, T.W. ed. 1997. *Global Trade Analysis: Modeling and Applications*. Cambridge University Press.
[31] Dandres, T., C. Gaudreaultb, P. Tirado-Seco et al. 2012. Macroanalysis of the economic and environmental impacts of a 2005–2025 European Union bioenergy policy using the GTAP model and life cycle assessment. *Renewable and Sustainable Energy Reviews*. 16:1180-1192.
[32] Hertel, T.W., A.A. Golub, A.D. Jones et al. 2010. Effects of US Maize Ethanol on Global Land Use and Greenhouse Gas Emissions: Estimating Market-mediated Responses. *BioScience*. 60(3): 223-231
[33] CARB 2009.

- More recently, Menten et al. (2015) have applied CLCA to the problem of GHG emissions from biomass-to-liquid (BTL) production.[34]

The problem of analyzing emissions resulting from Lease Sale 193 is considerably simpler than analyzing ILUC in the context of biofuels, and may be arguably less complicated than the analysis carried out by the Department of State for the Keystone XL pipeline. An accurate and transparent accounting of the environmental consequences of the lease sale would be invaluable to government decision makers, industry and the general public. Furthermore, such analysis is called for by NEPA, Executive Orders, the CEQ, and several recent Circuit and District Court rulings. The models and references provided above demonstrate that credible analysis and modeling linking economic, physical, biological and climate systems is already taking place, carried out both by government agencies and independent institutions. Therefore, we urge BOEM to take these methods under consideration and adapt them to the problem at hand.

Sincerely,

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[34] Menten, F., S. Tchung-Ming, D. Lorne et al. 2015. Lessons from the use of a long-term energy model for consequential life cycle assessment: The BTL case. *Renewable and Sustainable Energy Reviews*. 43:942-960.