

Comments & Recommendations regarding the “Atmospheric Environment: Overview of Potential Effects” document

Introduction

Preface and Caveat: The present comments prepared by the Sierra Club of Canada Foundation (“SCCF”) on the “Atmospheric Environment: Overview of Potential Effects” document (“Atmospheric Environment document”) are not to be construed as approving of either the approach and/or methodologies used or referenced in the literature review nor as approving of the current approach to the Regional Assessment (“RA”) in general. As we have expressed elsewhere and in the context of comments provided at RA Committee and TAG meetings, the SCCF has serious and extensive concerns relating to both the process, scope and content of the RA. While we will not reiterate all of them here, we do highlight several key concerns in the next subsection in that they constitute important context for our more specific comments on the Atmospheric Environment document.

Following brief comments on context, we present our specific comments on the Atmospheric Environment document, which we understand, from the invitation to comment, is intended to represent a summary of the existing and available literature on the potential effects of offshore exploratory drilling and associated activities, and which will ultimately serve as an appendix to the Regional Assessment Report.

Context for Comments on the Atmospheric Environment Document: Our key process concerns include, but are not limited, to the narrow scope of the RA, the lack of attention to the climate crisis and meeting government-mandated GHG reduction targets, the short timeframe for the RA, and the uncertainty around a fulsome and objective peer review process for scientific and policy information considered prior to the preparation of the RA Committee’s report. We summarize each of these briefly, below.

Scope of RA: SCCF continues to object to the exclusion of impacts of oil and gas drilling at the stage of production. Regional assessments should address all impacts likely to flow from the activity under consideration. To include only the impacts from the exploratory drilling phase of offshore oil and gas development and disregard impacts from production and end-use is to disregard long-term impacts, which comprise another type of cumulative impacts.

Lack of attention to the climate crisis and GHG reduction targets: Most Canadians are seriously concerned about the climate crisis and its implications for the well-being of Canada’s environment and the human communities it supports. As well, they recognize, as does the federal government, that Canada’s overall economic well-being going forward will be linked to the extent to which it strives to reduce its carbon footprint and embrace new, climate-friendly solutions. Seen in this light, it is essential that the RA give climate implications of expanded oil and gas drilling the attention it deserves.

Short timeframe for the RA: Put simply, the length of time designated for this RA is too short to afford the comprehensive, effective and meaningful treatment that the issue of offshore oil and gas development requires. Given the wide-ranging and long-lasting potential impacts that can

reasonably be expected from a new round of exploratory drilling, development and production in the study area, potentially involving the drilling of hundreds of new wells, it is only reasonable that the RA Committee ensure that the Regional Assessment happens according to a timeframe that reflects its importance.

Lack of a fulsome and objective peer-review process: It is not clear from documents or communications provided by the RA Committee thus far, whether or how the Committee will seek to subject the complete RA Report to a peer review process. It is important that draft chapters of the report be reviewed by relevant departments in the federal government, as well as by Indigenous governments and groups engaged in the process.

Comments specific to the Atmospheric Environment document

Substantial lacunae in the content and sources considered in the document

Current greenhouse gas reduction targets and plans are not discussed: Canada ratified the Paris Agreement on October 5th, 2016, following a vote in Parliament,¹ and has recently shown renewed interest in upholding its commitments under the Agreement. In this context, and given signals that the government will recommit to strong domestic climate policies, including the climate provisions in the *Impact Assessment Act*, it is imperative that a fulsome discussion of the federal and provincial greenhouse gas reduction targets, along with appropriate documentation, be included in any summary of the potential effects on the atmospheric environment of offshore oil and gas drilling.

Leading international sources of scientific knowledge on GHGs and their implications for climate change, such as the U.N. International Panel on Climate Change (IPCC), are absent: It is imperative that the Atmospheric Environment document reflect the latest information available from the IPCC on the sources and potential impacts of increasing greenhouse gas emissions from offshore oil and gas development.

Background information on marine sediments as a source of methane is absent: As one “mini-review” of methane leakage from offshore oil, gas and methane hydrate exploration observes, marine sediments are the largest global source of methane, and if a substantial amount of methane were to be released from the seafloor, the atmospheric methane concentration would rise dramatically.² There is ample scientific literature on this topic that must, in light of its importance in the current climate crisis, be reflected in the document.

Scope of the content and consequent limitation of sources considered

Limiting the review to research on emissions from exploration drilling only ignores an entire body of relevant research on methane releases from production: Obviously exploratory drilling – like drilling during production – causes disturbance to the seabed, yet nowhere in the document is it acknowledged

¹ Government of Canada, “The Paris Agreement”, <https://www.canada.ca/en/environment-climate-change/services/climate-change/paris-agreement.html>.

² See e.g., Zhang Y. and Zhai W.-D. (2015) "Shallow-ocean methane leakage and degassing to the atmosphere: Triggered by offshore oil-gas and methane hydrate explorations," *Front. Mar. Sci.* 2: 34, <https://doi.org/10.3389/fmars.2015.00034>, at p. 1, citing Kvendvolden, 2002 and Milkov, 2004.

that such disturbances are expected to trigger methane release from the sea floor. As a key industry source, in its description of the life cycle of offshore oil and natural gas activities explains:³

“The drilling process is the same for all types of wells drilled offshore – exploration wells, delineation wells (used to help determine the size and shape of a reservoir) and production wells (used to actually produce the oil and natural gas from a reservoir.”

Consequently, research on methane from drilling during production is certainly relevant to and should inform any discussion of GHG emissions from drilling during exploration.

A large body of published research exists on methane emissions from oil and gas drilling during production. To cite a very recent example, a study published in August 2019, headed by researchers at Princeton University found that offshore oil and gas rigs leak substantially more greenhouse gas than expected.⁴ Specifically, as one of the authors explained,

“The key finding from our study was that offshore oil and gas rigs in the North Sea leak more than twice as much methane as they currently report to the British government. When making measurements from fishing boats downwind of the rigs, we found leakage when they were in stand-by mode that was substantially higher than what they report using emission factors for active operations, such as flaring gas and transferring oil.”⁵

This kind of finding underscores the need for any assessment of GHG impacts from offshore oil and gas drilling to look carefully, and study thoroughly, the literature on methane leakage from oil and gas drilling operations, even during production, in case there are lessons to be learned and information to be gleaned that is relevant to the exploratory drilling context.

The review of literature must include information on methane leakage from abandoned wells: Published research is available on methane seeps that tend to occur around abandoned wells,⁶ and given the fact that many of the exploratory wells will ultimately be abandoned if they are not found to be worthy of development, it is critical that the Atmospheric Environment document address this topic. While apparently this issue is more critical for shallow-ocean drilling operations than for drilling in deeper waters, the research would be relevant given that some of the exploratory licence areas in the study area are in waters of a depth less than 150M (referred to as shallow-ocean drilling in the literature). It is

³ Canadian Association of Petroleum Producers (Undated) "Offshore Oil and Natural Gas Life Cycle", <http://atlanticcanadaoffshore.ca/offshore-oil-gas-lifecycle/>. See also Canadian Association of Petroleum Producers (October 2017) "Exploration drilling in Atlantic Canada Offshore", <https://www.capp.ca/-/media/capp/customer-portal/publications/309260.pdf?modified=20180526213409>.

⁴ Riddick, S. N. et al (2019) "Methane emissions from oil and gas platforms in the North Sea", *Atmos. Chem. Phys.*, 19, 9787–9796, <https://doi.org/10.5194/acp-19-9787-2019>.

⁵ Schultz, S., (2019) Office of Engineering Communications, Princeton University, "Controlling methane is a fast and critical way to slow global warming, say Princeton experts", September 19, 2019, <https://www.princeton.edu/news/2019/09/19/controlling-methane-fast-and-critical-way-slow-global-warming-say-princeton-experts>.

⁶ See e.g., Vielstädte, L. et al. (2017) "Shallow Gas Migration along Hydrocarbon Wells—An Unconsidered, Anthropogenic Source of Biogenic Methane in the North Sea", *Environ. Sci. Technol.* 2017, 51, 17, 10262-10268, <https://pubs.acs.org/doi/full/10.1021/acs.est.7b02732>; Helmholtz Centre for Ocean Research Kiel (GEOMAR), (2017) "Oil and gas wells as a strong source of greenhouse gases", *Science Daily*, August 28, 2017, <https://www.sciencedaily.com/releases/2017/08/170828102707.htm>.

important to recall that, according to an industry publication from October 2017, more than 300 exploration wells have been drilled in Atlantic Canada offshore.⁷

The review of literature must include information on the full lifecycle of all GHG emissions from oil and gas drilling, as well as information on methane mitigation strategies: The first topic is critical to fully understanding the impacts of oil and gas drilling on GHG emissions, while the second is essential for understanding what can be done, if anything, to effectively reduce methane emissions, whether due to leakage or planned releases. A literature review that does not address these two subjects and does not include available scientific sources is, in our opinion, incomplete.

Cumulative impacts of greenhouse gas emissions are entirely disregarded in the document

This following sentence, found in section 14.2 (p.1) of the document is extremely troubling in that it demonstrates either an ignorance of or cavalier disregard for basic principles relating to cumulative impacts:

“...since predicted GHG emissions from an individual project are low and insignificant in comparison to GHG targets, individual drilling programs have been predicted to have virtually no effect on current estimates of future global climate change.”

To slice the problem so thinly, such that only emissions from individual drilling programs are considered is to miss the point entirely that what matters in a regional assessment is the cumulative impacts that will result from emissions related to the drilling of hundreds of exploratory wells. This approach suggested by the quote above is simply unacceptable and arguably violative of the terms of the RA.

Furthermore, while the RA Committee report will, as we understand it, address the subject of cumulative impacts from oil and gas exploration in the study area, SCCF maintains that this does not negate the need to properly consider the operation of cumulative impacts within each sub-topic of the RA. To leave all discussion of cumulative impacts for one section of the report, without acknowledging their presence in relation to all of the assessment topics covered, is to risk creating a final report that will not accurately convey to decisionmakers the realities of the impacts from the planned oil and gas exploration.

Inaccuracy of factual content

Returning to the sentence that is the subject of the criticism above, Government of Canada data does not support the statement that emissions from individual projects are “low and insignificant”. GHG emissions from a single, average platform are estimated by Environment and Climate Change Canada to be equal to approximately 500,000 tonnes per year in the Atlantic offshore region, and this figure, of course, does not include downstream emissions from combustion of the extracted oil and gas.

In light of the province’s goal of more than doubling oil production by 2030 to 237 million barrels annually,⁸ and the fact that the province’s 2030 GHG emissions target is 6.9 MT,⁹ offshore oil production

⁷ Canadian Association of Petroleum Producers (October 2017) "Exploration drilling in Atlantic Canada Offshore", <https://www.capp.ca/-/media/capp/customer-portal/publications/309260.pdf?modified=20180526213409>.

⁸ https://www.nr.gov.nl.ca/nr/advance30/pdf/Oil_Gas_Sector_FINAL_online.pdf.

⁹ https://www.exec.gov.nl.ca/exec/occ/publications/The_Way_Forward_Climate_Change.pdf.

alone will represent 71% of provincial emissions, presuming targets are met. Given these realities, it is difficult if not impossible to see how anyone can describe the potential emissions from oil and gas platforms as “insignificant in comparison to GHG targets”.

Errors such as these are indicative of a failure to consider important, credible and up-to-date sources of information and can lead to a sub-standard final report.

Insufficiency of sources generally, and insufficiency of up-to-date sources

We are concerned with the paucity of independent, scientific, peer-reviewed articles provided. It is imperative, especially given the strong involvement of industry in this RA process, that the sources considered by the RA Committee in the preparation of its report include a fulsome treatment of the available scientific and academic literature on emissions to the atmosphere from oil and gas exploration and – for reasons discussed above – production. Such sources must, of necessity include all relevant sources published both inside and outside of Canada.

More specifically, the document provides very few sources for what should be a comprehensive and reliable compilation of sources, given that the purpose is to guide major policy decisions having far-reaching implications for the environment. For example, of the 14 sources provided, only four (4) were published in the last 5 years, and two of the sources were unrelated to the topic of atmospheric emissions from oil and gas drilling (these concerned impacts of anthropogenic underwater sound).

By contrast, a single 2015 academic article described by the authors as a “mini-review” of recent knowledge on the subject of methane leakage and degassing to the atmosphere from offshore oil, gas and methane hydrate explorations, cite no less than 88 sources.¹⁰ Furthermore, the article just mentioned covers shallow-ocean methane leakage only. Studies of deep-ocean methane leakage would also need to be covered in any reasonable literature review on the topic of GHG impacts of oil and gas exploration.

While some of the potential exploratory licensing areas in the study area do, indeed, fall into the category of “shallow-ocean” drilling covered in studies of shallow-ocean methane leakage (ocean depths of less than 100 or 150M, depending on the study), the literature should also cover methane leakage and degassing to the atmosphere of deep ocean drilling. While the aforementioned study points out that methane degassing to the atmosphere appears to be water-depth dependent,¹¹ (the deeper the methane release, the more exposure there is to the reducing impacts of methane-consuming bacteria), some studies indicate that depth may not be the only factor: tidal influences and currents can also impact the rate at which methane rising to the surface is reduced by methane oxidizing bacteria.¹²

The point here is that a cursory look at the literature suggests a multitude of complex factors that have been previously studied and must be considered in relation to evaluating methane release to the

¹⁰ Zhang Y. and Zhai W.-D. (2015) "Shallow-ocean methane leakage and degassing to the atmosphere: Triggered by offshore oil-gas and methane hydrate explorations," *Front. Mar. Sci.* 2: 34, <https://doi.org/10.3389/fmars.2015.00034>.

¹¹ Ibid.

¹² See e.g., Steinle et al. (2015) “Water column methanotrophy controlled by a rapid oceanographic switch”, *Nat. Geosci.* 2015, 8, 378-383; Steinle et al. (2016) “Linked sediment and water-column methanotrophy at a man-made gas blowout in the North Sea: Implications for methane budgeting in seasonally stratified shallow seas”, *Limnol. Oceanogr.* 2016, 61, 367-386.

atmosphere from oil and gas drilling operations.

Conclusions and Recommendations

Conclusions

For sake of brevity, and acknowledging that SCCF will continue to address its concerns about the process and scope of the RA through other submissions or communications to the RA Committee, the conclusions presented in this section relate specifically to our views on the Atmospheric Environment document. In brief, SCCF finds that the document does not live up to the standards that would normally be expected for a review of literature intended to inform a report that will, in turn, inform decisions of a far-reaching nature. The document is insufficient in terms of scope of content and substantially lacking in terms of the number and quality of the sources relied upon. As we have previously stated, issues relating to GHG emissions must be viewed and treated with the seriousness they deserve in light of the fact that we are currently living in a climate crisis – a fact that has been acknowledged at many levels of government in Canada.

Recommendations

1. **The Atmospheric Environment document must acknowledge, include and discuss how GHG emissions from offshore drilling – both at exploration and production – will be evaluated in relation to global, federal and provincial GHG reduction targets and plans.** This information is critically important to the question of how the federal and provincial governments intend to meet their GHG emission reduction objectives while at the same time expanding offshore oil and gas drilling activities.
2. **The document must address the issue of GHG impacts from offshore oil and gas drilling in a way that respects the spirit if not the letter of the *Impact Assessment Act* and its requirements concerning Canada's climate obligations.**
3. **The document must be sufficiently broad as to cover reported research on emissions related to oil and gas production as well as those related to exploration.** As explained above, since much of the drilling process is the same for exploration wells and production wells, studies of impacts like methane leakage from oil and gas drilling during production will contain information relevant and important to methane leakage from oil and gas drilling operations during exploration.
4. **The document must take a substantially broader, more comprehensive view of atmospheric emissions from oil and gas drilling than it currently does.** The document does not discuss GHG emissions in any serious or complete way, and all but ignores the topic of methane leakage – a critical issue for GHG impacts – despite the existence of a vast body of scientific and academic literature on the topic.
5. **The document must review and discuss all major studies of life-cycle emissions from offshore gas and oil drilling, regardless of jurisdiction.** As SCCF and others have previously asserted, the impacts from oil and gas drilling – including emissions – must include those from the entire

lifecycle.

6. **The document must reflect, at a minimum, a reasonable effort to review and summarize all relevant information pertaining to GHG emissions and other emissions that may affect the atmosphere.** This must entail the review of a vastly greater number of studies and sources than those referenced in the current document and should include a greater proportion of scientific and academic studies relative to industry-sponsored studies or studies by the C-NLOPB and C-NSOPB.
7. **The document must be subject to a peer-review process prior to consideration by the RA Committee for inclusion in the final report.** Additionally, sufficient time must be allowed for those preparing the report to respond to input from the peer-review process, in order to improve the quality, credibility and usefulness of the final document.

Appendix: A Sample of Suggested Sources for the Atmospheric Environment document

Please note that the following sources are in no way intended to serve as a completion of the sources included in the current Atmospheric Environment document. They are offered here only as a sample of the kinds of published studies that are relevant to the topic and available.

Bylin C., U.S. Environmental Protection Agency; Schaffer, Z., ICF International; Goel, V., ICF International; Robinson, D., ICF International; do N. Campos, A., COPPE/UFRJ; Borensztein, F., Devon Energy do Brasil Ltda. (2010) "Designing the Ideal Offshore Platform Methane Mitigation Strategy" [SPE 126964], Paper presented at the SPE International Conference on Health, Safety and Environment in Oil and Gas Exploration and Production held in Rio de Janeiro, Brazil, 12–14 April 2010, <https://www.epa.gov/sites/production/files/2016-09/documents/spe126964.pdf>

Cordes, E. E. et al, (2016) "Environmental Impacts of the Deep-Water Oil and Gas Industry: A Review to Guide Management Strategies", *Front. Environ. Sci.* 16 September 2016, <https://doi.org/10.3389/fenvs.2016.00058>.

Helmholtz Centre for Ocean Research Kiel (GEOMAR), (2017) "Oil and gas wells as a strong source of greenhouse gases", *Science Daily*, August 28, 2017, <https://www.sciencedaily.com/releases/2017/08/170828102707.htm>.

Riddick, S. N. et al (2019) "Methane emissions from oil and gas platforms in the North Sea", *Atmos. Chem. Phys.*, 19, 9787–9796, <https://doi.org/10.5194/acp-19-9787-2019>.

Steinle, L. et al. (2015) "Water column methanotrophy controlled by a rapid oceanographic switch", *Nat. Geosci.* 2015, 8, 378-383, <https://www.nature.com/articles/ngeo2420>.

Steinle, L. et al. (2016) "Linked sediment and water-column methanotrophy at a man-made gas blowout in the North Sea: Implications for methane budgeting in seasonally stratified shallow seas", *Limnol. Oceanogr.* 2016, 61, 367-386, https://www.researchgate.net/publication/309740202_Linked_sediment_and_water-column_methanotrophy_at_a_man-made_gas_blowout_in_the_North_Sea_Implications_for_methane_budgeting_in_seasonally_stratified_shallow_seas.

Sullivan, J. (2019) Office of Engineering Communications, Princeton University, "Offshore oil and gas rigs leak more greenhouse gas than expected", Aug. 15, 2019, <https://www.princeton.edu/news/2019/08/15/offshore-oil-and-gas-rigs-leak-more-greenhouse-gas-expected>.

Vielstädte, L. et al. (2017) "Shallow Gas Migration along Hydrocarbon Wells—An Unconsidered, Anthropogenic Source of Biogenic Methane in the North Sea", *Environ. Sci. Technol.* 2017, 51, 17, 10262-10268, <https://pubs.acs.org/doi/full/10.1021/acs.est.7b02732>.

Zhang Y. and Zhai W.-D. (2015) "Shallow-ocean methane leakage and degassing to the atmosphere: Triggered by offshore oil-gas and methane hydrate explorations," *Front. Mar. Sci.* 2: 34, <https://doi.org/10.3389/fmars.2015.00034>.