Consultation on Canada's draft Clean Hydrogen Investment tax credit

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About Environmental Defence Canada
Environmental Defence is a leading Canadian advocacy organization that works with government, industry and individuals to defend clean water, a safe climate and healthy communities.

Environmental Defence Canada recognizes that the strategic deployment of renewable hydrogen technology has the potential to help Canada meet its climate commitments by decarbonizing the sectors of the economy that do not have existing electrification solutions. Finance Canada's proposed investment tax credit will be an important tool in supporting the growth of renewable hydrogen technologies.

Environmental Defence has significant concerns with the proposed draft legislation. To ensure the tax credit aligns with Canada's climate commitments and supports economy wide decarbonization, the following recommendations must be implemented.

- The tax credit should not be made available to any form of fossil-derived hydrogen.
- The tax credit should only support forms of hydrogen with virtually no greenhouse gas emissions (no greater than 1.0 kg CO_2e per kg H_2).
- The calculated carbon intensity must include emissions from across the full life cycle of hydrogen production, including upstream methane leakage as well as the indirect global warming impact of hydrogen leakage. Hydrogen producers should have to certify that they have effective hydrogen emissions management plans in place.
- The design of the tax credit must ensure that hydrogen projects don't rely on existing renewable energy capacity or displace renewable energy from better uses. This can be done by ensuring the ITC incorporates the principles of additionality, deliverability and hourly matching. The untargeted use of hydrogen risks complicating decarbonization efforts. Hydrogen should therefore be reserved for the hardest-to-decarbonize sectors that do not have viable decarbonization alternatives. The ITC must give some consideration to the applications which hydrogen will be used for.
- Hydrogen made by renewable natural gas should not be eligible.
- Ensure the tax credit doesn't exacerbate affordability challenges for Canadians.
- Proponents should not be able to access other sources of government funding.
- The tax credit should only be made available for projects that have free, prior and informed consent from Indigenous communities.
- Companies receiving tax credits must be held accountable to mitigate harmful impacts on impacted communities.
- Companies must comply with prevailing union wages and apprenticeship requirements in order to receive the tax credit. Both measures will be necessary to uphold strong working conditions in the rapidly growing green economy and to attract the necessary skilled workers while providing apprentices with vital on-the-job training.

Fossil hydrogen projects should be ineligible to receive the tax credit

As proposed, the ITC would likely be used to subsidize fossil hydrogen projects. Subsidizing fossil hydrogen further locks Canada into a fossil-based economy. Public spending on fossil hydrogen constitutes a fossil fuel subsidy, therefore violating the Government of Canada's own rules.

Hydrogen produced from fossil fuels - including pathways that use carbon capture and storage (CCS) to reduce GHG emissions - should not be eligible for support. The emissions abatement potential of blue hydrogen relies on CCS. Despite decades of research, CCS is neither economically sound nor proven at scale, with a terrible track record and limited potential to deliver significant, cost-effective emissions reductions.[1] A 2021 study found that more than 80 per cent of the CCS projects attempted in the U.S. have ended in failure.[2] A 2022 report analyzed 13 flagship CCS projects - comprising over half of the total nominal capture capacity operating worldwide - and found that 10 of these projects are either underperforming or have failed completely.[3]

Recent studies confirm that fossil-based hydrogen, even with carbon capture, offers no climate benefits over using fossil fuels directly.[4] In fact, a recent study from Cornell and Stanford found that the greenhouse footprint of 'blue' fossil hydrogen can be up to 20% higher than burning coal or fossil gas directly, and concludes there is no role for fossil hydrogen in a carbon-free future.[5]

Furthermore, blue hydrogen production does not address the other impacts associated with exploring and developing fossil gas deposits, including Indigenous rights violations, biodiversity, water, air quality, and the industry's failures to remediate wells. An increasing share of Canadian fossil gas production is made up by fracking.[6] In areas surrounding fracking operations, groundwater and surface water have been found to be polluted by the chemicals, which in some instances have been linked to cancer.[7]

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[1] Levin, J. (2022) Buyer Beware: Fossil Fuels Subsidies and Carbon Capture Fairy Tales in Canada. Environmental Defence Canada. Available: https://environmentaldefence.ca/wpcontent/uploads/2022/03/Buyer-Beware-FFS-in-2021-March-2022.pdf

[2] Abdulla A. et al (2021) Explaining successful and failed investments in U.S. carbon capture and storage using empirical and expert assessments. Environ. Res. Lett. Available: https://iopscience.iop.org/article/10.1088/1748- 9326/abd19e/pdf

[3] Robertson, B. & Mousavian, M. (2022) The carbon capture crux: Lessons learned. Institute for Energy Economics and Financial Analysis. Available: https://ieefa.org/resources/carbon-capture-crux-lessons-learned

[4] Zhou, Y. et al. (2021) Life-Cycle Greenhouse Gas Emissions of Biomethane and Hydrogen Pathways in the European Union. The International Council on Clean Transportation. Available: https://theicct.org/publication/life-cycle-greenhouse-gas-emissions-of-biomethane-and-hydrogenpathways-in-the-european-union/

[5] Howarth, R. & Jacobson, M. (2021) How green is blue hydrogen? Energy Science and Engineering. Available: https://www.actu-environnement.com/media/pdf/news-38015-etude-energy-scienceengineering-hydrogene-bleu.pdf

[6] National Energy Board (2022). Historical Canadian Provincial Marketable Natural Gas Production. Available at: https://open.canada.ca/data/en/dataset/3bb59253-94d9-47e7-893d-5a794496e931

[7] Vogel, L. (2017). Fracking tied to cancer-causing chemicals. Canadian Medical Association Journal. 189 (2) E94-E95. Available at: https://doi.org/10.1503/cmaj.109-5358

The only scalable and truly low-emissions hydrogen is produced from solar or wind-generated electricity. A focus on enabling renewable hydrogen is the only way to have an emission-free hydrogen strategy that aligns with the profound transformation required to move Canada's energy system from one largely based on fossil fuels to renewable energy systems.

Not only is blue fossil hydrogen not a climate–aligned technology, its deployment carries significant financial risks. By the time planned blue hydrogen projects become operational, most of the expected market for energy demand will have been taken over by renewable energy, electrification and renewable hydrogen.[8] This means that spending on blue fossil hydrogen comes with a significant risk of creating stranded assets.[9] Fossil hydrogen production cannot be considered as a temporary or interim measure. Hydrogen plants typically have an operational life of 30 years - meaning any new hydrogen production facilities will likely be operating into the 2060s.[10]

As well as undermining government efforts to reach net-zero by 2050, allowing this tax credit to apply to blue hydrogen projects would contradict the Government of Canada's own rules to end fossil fuel subsidies.

Blue hydrogen locks us into prolonged fossil fuel dependence at a time when preventing catastrophic climate change requires winding down fossil fuel use. The ITC should make all fossil hydrogen projects explicitly ineligible.

The tax credit should only support forms of hydrogen with virtually no greenhouse gas emissions (no greater than 1.0 kg CO2e per kg H2)

Only projects with emissions intensity levels no greater than 1.0 kg CO2e per kg H2, across the entire production supply chain, for the entire lifecycle of hydrogen should receive the tax credits. In fact, many organisations, including the Hydrogen Science Council and the Green Hydrogen Organization, use a standard threshold of <1 kg CO2e per kg H2, including GHG emissions from the entire supply chain.[11]

Defining clean hydrogen as having a carbon intensity of less than 4 kg CO2 per kg of H2 is too broad to incentivize necessary emission reductions. The current proposed tiers fail to properly incentivize the cleanest hydrogen projects. The Government of Canada should only offer the greatest tax credit to producers with a carbon intensity of 0.45 kg CO2e/kg H2 or less, as the US is doing with their hydrogen tax credit.

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[8] Sanzillo, T. et al. (2022) Federal blue hydrogen incentives: No reliable past, present or future. IEEFA. Available: https://ieefa.org/ieefa-u-s-federal-blue-hydrogen-incentives-no-reliable-past-present-or-future/

[9] Longden, T. et al. (2022) 'Clean' hydrogen? – Comparing the emissions and costs of fossil fuel versus renewable electricity based hydrogen. Applied Energy, 306 (B). Available: https://www.sciencedirect.com/science/article/abs/pii/S0306261921014215?dgcid=author

[10] https://h2sciencecoalition.com/wp-content/uploads/2022/12/Clean-Hydrogen-Definition_final.pdf

[11] Green Hydrogen Organisations (2022) The GH2 Green Hydrogen Standard. Available: https://gh2.org/our-initiatives/gh2-green-hydrogen-standard

Environmental Defence recommends that Finance Canada use the following carbon intensity tiers and credit rates:

Carbon Intensity Tiers (CO2e per kg of H2 produced taken as an average over a 12-month period)	Investment Tax Credit Rates
<0.45 kg	40%
0.45 kg to <0.65 kg	30%
0.65 to <1 kg	20%

Emissions intensity levels must include the full life cycle of hydrogen, including methane leakage and the indirect global warming potential of hydrogen leakage

Environmental Defence agrees with the need to ensure that companies are transparent about the full lifecycle emissions of the hydrogen they are producing, including upstream input emissions. The rules are clear that the emissions intensity must include emissions associated with the production and transmission of natural gas to the hydrogen production plant. For example, Shell claims that its Alberta–based Quest CCS project – which captures carbon from the production of hydrogen from fossil gas – has a capture rate of 80 per cent. But when the plant's full emissions are considered, as well as the emissions from the energy used to power the CCS system and the methane leakage from the extraction and transportation of the fossil gas, the total capture rate falls to 39 per cent.[12]

However, it is unclear how methane leakage from the production and transportation of natural gas will be considered. It is critical that methane emissions are accurately accounted for, using a 20 year Global Warming Potential in order to better account for the near-term climate impacts from methane. A recent investigation found that some companies are releasing four times more methane than what they're reporting to governments.[13] If the ITC fails to get the accounting right, upstream emissions could cancel out a large portion of the positive climate benefit.

Furthermore, we are concerned that the proposed rules exclude hydrogen leakage entirely, and assume that hydrogen leaks are negligible. Hydrogen itself is not climate neutral. It is an indirect greenhouse gas, with more than 35 times the warming power of CO2 in the first twenty years[14]

[12] Global Witness (2022) Hydrogen's hidden emissions. Available: https://www.globalwitness.org/en/campaigns/fossil-gas/shell-hydrogen-true-emissions/

[13] Festa-Bianchet, S. et al. (2023) Methane Venting at Cold Heavy Oil Production with Sand (CHOPS) Facilities Is Significantly Underreported and Led by High-Emitting Wells with Low or Negative Value. Environ. Sci. Technol. Available: https://doi.org/10.1021/acs.est.2c06255

[14] https://www.gov.uk/government/publications/atmospheric-implications-of-increased-hydrogen-use

and 100 times over the first ten years.[15] Like the direct greenhouse gases, hydrogen should be accounted for in the climate impact calculations that determine the tax credit value. Furthermore, producers should have to certify that they have effective hydrogen emissions management plans in place.

We agree with the proposed design to account for any captured carbon that is used for an ineligible use such as enhanced oil recovery.

We agree with the need to have third-party verification and validation by Natural Resources Canada. This information should also be made publicly available.

Ensure that hydrogen projects don't absorb existing renewable energy capacity or displace renewable energy from better uses.

Ensuring Additionality, Deliverability and Hourly Matching
In the proposed ITC, the government has taken some steps to ensure that the ITC doesn't consume existing renewable energy capacity, by only considering power purchase agreements where the purchased energy is new, that it comes from hydro, solar or wind, and it is produced in the same province or territory. These are critical elements.

However, the ITC should go a step further and adopt a similar approach to the United States and the European Union. For all renewable hydrogen projects, the principles of additionality, deliverability and temporality must be enforced. The electricity used or purchased to produce green hydrogen must be:

- provided by new carbon-free sources of power, that are *additional* to existing generation;
- delivered efficiently within the same region; and
- matched hourly with the hydrogen plant's power consumption, to avoid reliance on fossil-fuel fired generation for backup.

Only projects that fulfill these three criteria should be eligible for the ITC. These rules aim to ensure hydrogen production is not siphoning clean electricity from the grid that would otherwise be used to power homes, businesses and electrical vehicles.

Reserve hydrogen use for the hardest-to-decarbonize, domestic sectors
The untargeted use of hydrogen may actually complicate the task of decarbonizing by delaying the deployment of electrification and energy efficiency. Widespread deployment of hydrogen in applications that can be more efficiently decarbonized with alternatives risks putting significant pressure on the energy system, unnecessarily increasing the costs of the transition to a clean economy, and complicating climate progress. Furthermore, given the complexities, costs and risks of transporting hydrogen, Canada should prioritise producing and consuming hydrogen locally**.**

[15] Ocko, I. & Hamburg, S. (2022) Climate consequences of hydrogen emissions. Environmental Defense Fund. Available: https://acp.copernicus.org/articles/22/9349/2022/

Although companies producing hydrogen may not be responsible for the application of that hydrogen, it is rare that these projects move ahead without buyers lined up. The tax credit should target strategic applications and certain applications should be ineligible where their use would delay better decarbonization solutions, such as blended hydrogen for home heating or for power generation.

Hydrogen produced from 'renewable' natural gas should not be eligible

Producing hydrogen from renewable natural gas (RNG) is not zero emissions, given the methane leakage associated with producing and transporting RNG.

Ensure affordability challenges aren't exacerbated

Expanding hydrogen production risks exacerbating affordability challenges. There is robust evidence that in many of the applications where hydrogen is currently being proposed, such as home heating and passenger cars, electrification is a more efficient and affordable solution.[16] A recent review of 32 independent studies that looked at the use of hydrogen in homes concluded that hydrogen for heating and cooking is a distraction: it is inefficient, costly and resource intensive.[17] For example, heat pumps are five to six times more efficient than using gas blended with hydrogen.[18] Consumer bills for heat from hydrogen could be 50% greater than if the heat were electric.[19] Research shows that blending 20% hydrogen into the fossil gas grid could lead to price increases of up to 43% for industrial consumers, and up to 16% for household consumers.[20] Subsidizing hydrogen projects in these sectors may result in Canadins paying more to meet their basic needs.

Blue hydrogen production results in increased natural gas usage, which could then increase the costs of natural gas for Canadians**.**[21] For example, using blue hydrogen to heat a home uses at least 40% more gas than boilers using fossil gas outright.[22]

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[16] UNFCCC (2021) Guiding Principles for Climate-Aligned Hydrogen Deployment. Available: https://racetozero.unfccc.int/wp-content/uploads/2021/10/Hydrogen-Guiding-Principles_vFinal.pdf

[17] Rosenow, J. (2022) Is heating homes with hydrogen all but a pipe dream? An evidence review. Joule, 6(10). Available:https://www.sciencedirect.com/science/article/pii/S2542435122004160

[18] Energy Transitions Commission (2021). Making the Hydrogen Economy Possible: Accelerating Clean Hydrogen in an Electrified Economy, www.energy-transitions.org/wp-content/uploads/2021/04/ETCGlobal-Hydrogen-Report.pdf

[19] Davis, M. *et al.* (2023). Greenhouse gas reduction potential and cost-effectiveness of economy-wide hydrogen-natural gas blending for energy end uses. *Renewable and Sustainable Energy Reviews*, *171*, 112962. Available: https://doi.org/10.1016/j.rser.2022.112962

[20] Bard, J. *et al.* (2022) *T*he Limitations of Hydrogen Blending in the European Gas Grid: A study on the use, limitations and cost of hydrogen blending in the European gas grid at the transport and distribution level. Fraunhofer Institute for Energy Economics and Energy System Technology. Available: https://www.iee.fraunhofer.de/content/dam/iee/energiesystemtechnik/en/documents/Studies-Reports/FINAL_FraunhoferIEE_ShortStudy_H2_Blending_EU_ECF_Jan22.pdf

[21] Gaster, R. (2024) A Realist Approach to Hydrogen. Information Technology & Innovation Foundation. Available: https://itif.org/publications/2024/01/16/a-realist-approach-to-hydrogen/

[22] Barrett, M. & Cassarino, T.G. (2021) Heating with steam methane reformed hydrogen – a survey of the emissions, security and cost implications of heating with hydrogen produced from natural gas. Centre for Research into Energy Demand Solutions. Available: https://www.creds.ac.uk/wp-content/uploads/CREDS-Heating-steam-methane-reformed-hydrogen.pdf

Proponents should not be able to access other sources of government funding

Environmental Defence Canada agrees with the approach taken by the Government of Canada to ensure that companies are not allowed to double dip between various investment tax credits.

In addition, hydrogen projects that receive funding from other federal sources should not be eligible for the investment tax credit. It is not the role of the government, or the taxpayers, to shoulder the entire financial risk for private companies who stand to make significant profits.