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Pembina Institute Response to the Clean Electricity Standard Discussion Paper

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Content

Context

The Clean Electricity Standard (CES) is the key regulatory instrument that the federal government is proposing to achieve a net-zero emissions electricity system by 2035 (referred to by Environment and Climate Change Canada as NZ2035 in the CES discussion paper).[1] The federal government is developing the CES to pursue NZ2035 alongside other crucial measures, including industrial carbon pricing (the Output Based Pricing System Regulations) and several supportive investments and programs. In this way, the CES forms part of an overall policy suite.

As a regulatory standard applicable to emitting electricity generators implemented under the Canadian Environmental Protection Act (CEPA) — and enjoying its strong enforcement mechanisms — the CES can be the cornerstone policy tool to send the clear investment signal against unabated emitting electricity generation in Canada, if designed properly. By sending a clear and unambiguous signal, an effectively designed CES will:

- achieve a competitive non-emitting electricity system that is attractive to investors and job creators with environment, social and governance (ESG) goals and pressures from financial markets, and
- protect ratepayers, investors, and public finances from having to cover stranded capital resulting from climate-incompatible investments between now and 2035.

What does a net-zero grid mean?

A net-zero grid means having non- or near zero-emitting electricity generation supply, with any remaining emissions fully offset.[2] A net-zero grid should be primarily supplied by cost-effective non-emitting technologies including renewables, storage, transmission interties, and demand flexibility. Currently, Canada is set to see significant growth in natural gas-fired generation to replace the retiring coal capacity and to meet increasing demand. For a grid that is viewed as credibly net-zero by Canada's international peers, investors, and companies with ESG goals, it cannot include unabated natural gas generation beyond truly emergency applications. Moreover, any remaining emissions from the balance of carbon emissions that are

[1] Environment and Climate Change Canada, *A Clean Electricity Standard in support of a net-zero electricity sector: Discussion Paper* [*CES Discussion Paper*] (2022), 5.

[2] *CES Discussion Paper*: "Net zero electricity means Canada's stated goal of having the electricity sector achieve, in effect, no emissions of greenhouse gases (GHG) by 2035, or emissions are offset by other actions that remove carbon from the atmosphere. This only includes direct emissions and does not include lifecycle or upstream emissions. In realizing this goal, it is expected that some low-emitting generation facilities may continue to operate past 2035. The emissions resulting from this operation would need to be balanced by removals in or attributed to the sector."

not captured or from emergency unabated fossil fuel use must be fully offset by credible, verifiable greenhouse gas removals.

Why is a net-zero grid necessary?

Achieving a net-zero electricity grid by 2035 provides both climate and economic benefits for Canada. A clean grid is essential for achieving net-zero GHG emissions economy wide by 2050 and the 40-45% emissions reductions by 2030 from 2005 levels as outlined in the sectoral plan in Canada's 2030 Emissions Reduction Plan.[3] In addition to reducing emissions from electricity generation, it is essential for other sectors (e.g., buildings, transportation, heavy industry) to achieve net-zero through electrification, substituting the use of fossil fuels with clean electricity. Electrification is expected to offer the most cost-effective option for decarbonizing these sectors, but that option is not on the table in the absence of clean electricity supply.

Canada is not alone in this endeavour. The International Energy Agency has determined that all developed countries must achieve a net-zero grid by 2035 in order to keep global temperature rise to under 1.5°C. Countries like the U.S., the U.K. and Germany have also committed to a net-zero or clean grid by 2035. In fact, the U.K. grid operator is on track to be able to operate the grid with zero-carbon energy by 2025.[4]

A net-zero grid protects and enhances economic opportunities with the grid as the backbone. Clean energy sources like wind, solar, and battery storage are cheaper than traditional thermal generation, and in many cases, new-build wind and solar projects are cheaper than existing conventional generation.[5] As demand for a net-zero grid grows in concert with corporate ESG and net-zero commitments, a clean grid can attract and retain investment and support job creation. General Motors's decision to locate their new cathode battery plant in Quebec because of Quebec's "low-cost, 'zero-GHG electricity'" system[6] underscores this trend. Additionally, Canada is the largest source of United States energy imports.[7] As the United States also considers a Clean Electricity Standard, Canada is well-positioned to scale up clean

[3] Environment and Climate Change Canada, *2030 Emissions Reduction Plan – Canada's Next Steps for Clean Air and a Strong Economy* (2022). https://www.canada.ca/content/dam/eccc/documents/pdf/climate-change/erp/Canada-2030-Emissions-Reduction-Plan-eng.pdf

[4] National Grid ESO, *Road to Zero Carbon*. https://www.nationalgrideso.com/future-energy/our-progress/road-zero-carbon

[5] Carbon Tracker, *Put Gas on Standby* (2021). https://carbontracker.org/reports/put-gas-on-standby/

[6] Electric Autonomy, *GM, Posco to build $500-million Canadian cathode active material factory in Quebec to supply Ultium battery factories.* https://electricautonomy.ca/2022/03/07/gm-posco-cathode-factory-quebec/

[7] U.S. Energy Information Administration, *Canada is the largest source of U.S. energy imports*. https://www.eia.gov/todayinenergy/detail.php?id=43995

energy production to export affordable and reliable electricity that meets the U.S. Clean Electricity Standard criteria.

Key outcomes for the Clean Electricity Standard

The CES that the federal government is planning will come in the form of new regulations under CEPA applicable to "all sources of emitting electricity generation that sell to the electricity system."[8] It is intended to phase out all conventional fossil fuel electricity generation by setting emissions performance standards for these generation sources. This approach can include certain flexibilities and offset usage by remaining emitting technologies to aid with reliability and economic feasibility during the transition. The key outcomes of the detailed CES design need to include:

- Sending an immediate signal that prevents investment in emitting electricity generation assets and encourages investment in zero- or negative-emissions electricity.
- Generating early and deep reductions of GHGs, rather than relying on greater reductions closer to 2035.
- Securing cost-effective GHG reductions.
- Protecting and enabling energy affordability and access to electricity.
- Delivering a credible net-zero grid by 2035 that is nearly non-emitting and for which any residual emissions are fully offset with credible offsets from emissions negative activities.

Achieving the above outcomes will also help establish the credibility of the standard for global climate commitments, and will also be particularly important to companies with ESG goals that are looking to invest in Canada.

The Pembina Institute submits this document in response to the ECCC CES discussion paper to provide insights into how a Clean Electricity Standard can deliver a credible net-zero grid that results in significant emissions reductions and that has near-zero emissions by 2035. The content of this document reflects the Institute's most recent understanding and research on the topic. The Institute will continue to publish and submit further comments through the CES development process as further research is conducted and additional modelling results are available.

[8] *CES Discussion Paper*, 9.

CES discussion paper questions

General

1. Should interim standards be included in the period before 2035?

Yes, interim standards are essential to send an immediate and clear signal to invest in zero- and negative-emission electricity generation assets in the short and medium term, and to ensure that the Clean Electricity Standard leads to early and deep reductions of greenhouse gases rather than relying on greater reductions closer to 2035.

We suggest that the first interim standards be set for 2024, which will let the CES send an immediate signal against new unabated natural gas generation and to build momentum for the grid transformations needed to reach NZ2035. Subsequent interim standards should align with Canada's Emissions Reduction Plan and the Canadian Net-Zero Emissions Accountability Act: 2026, 2030 and 2035. In addition, these interim standards should be made clear from the outset of the Clean Electricity Standard's introduction.

To avoid backsliding, stranded assets or the lock-in of emitting technologies, long-term policy certainty will be important for provinces, regulators, and utilities to plan for the transition to Canada's net-zero grid by 2035. Unfortunately, this can be undermined by political uncertainty over multiple election cycles. For that reason, near-term policy certainty to definitively prevent locking new capital into generation that will ultimately be stranded is vital to avoid future costs for taxpayers and ratepayers.

2. How should the CES regulation be designed to minimize stranded capital assets and associated rate impacts?

The CES should be designed to send an immediate, clear signal that prevents new emitting generation. The timeline for a CES that achieves net-zero emissions across the sector by 2035 is such that any new emitting generating asset will become stranded before its typical end of useful life, if the operator is unable to invest in retrofits that would reduce the emissions and/or to purchase offsets.

The CES should be designed to render emitting sources more expensive to operate over time by incrementally making the emissions intensity standards more stringent, so that it diverts investments rapidly and incentivizes investment in clean generating sources.

For existing assets, where investment in physical capital was made before the 2021 net-zero grid commitment, the key mechanisms to avoid stranded capital will come from outside of the

CES. In particular, governments have a critical role to support retrofitting and application of technologies that can make use of existing capital without emissions or with very low emissions. Where assets cannot economically meet the CES standards either through emissions capture or other flexibility mechanisms, other mechanisms can be deployed to handle the impact of stranded assets, such as securitization.[9] However, such mechanisms should be deployed judiciously, based on predetermined criteria.

3. What would be an acceptable end-point emissions intensity standard to achieve the objective of the CES?

The end-point emissions standard must be set at zero kg CO_2e/MWh in order to send a clear signal to investors and operators and to credibly claim that Canada's electricity systems are truly net-zero. Continuing flexibility mechanisms may be used to achieve "net" zero kg CO_2e/MWh to enable operation of assets that cannot physically meet the standard but are required for emergency purposes. However, the use of such mechanisms should continue to decline.

4. How do considerations differ for non-competitive electricity markets, vertically integrated utilities, etc.?

No comment.

Compliance flexibilities

5. Should the CES offer compliance flexibilities?

Limited compliance flexibilities for existing emitting generation facilities may be helpful in managing the cost of the transition, and to allow critical emitting assets that are unable to be replaced by non-emitting solutions to operate. However, eligibility criteria should be put in place to ensure that flexibilities are used only when absolutely necessary, accompanied by requirements that their use decrease over time. Eligibility criteria should be based on a set of principles, including:

- Facilities must demonstrate that zero-emissions solutions are not feasible (this includes not only non-emitting generation in the jurisdiction but also demand-side management and clean imports).

[9] Christian Fong, Sam Mardell, "Securitization in Action: How US States Are Shaping an Equitable Coal Transition," *RMI,* March 4, 2021. https://rmi.org/securitization-in-action-how-us-states-are-shaping-an-equitable-coal-transition/

- The flexibility mechanism results in credible real emissions reductions equivalent to what would be achieved under the standard. To ensure that emissions reductions are not measured against an artificial baseline, offsets should be limited to verifiable carbon dioxide removals ("negative emissions").
- Eligibility criteria should become more restrictive over time.

No compliance flexibilities should be provided to new emitting generating assets beyond those deploying CCUS from the outset.

a. What kinds of flexibilities?

Experience from carbon pricing schemes and NOx/SO_2 emissions reduction mechanisms[10] have shown that compliance flexibilities could include offsets or emission performance credits. However, in order to minimize emissions, to meet true net-zero emissions intensity for the grid,[11] and to incentivize rapid action, the flexibility mechanisms must:

- Be credible negative emissions
- Ensure that they are quantifiable and verifiable
- Ensure that the emissions reductions are permanent
- Ensure additionality - investments that would have happened under business-as-usual should not qualify

b. Should the flexibilities be targeted to individual generating units? To corporate fleets of units, such as fleet averaging, etc.?

Compliance as well as flexibilities should be at the individual unit level, since at any given facility there may be units of different vintage, different technologies and varying fuel types or fuel blends (e.g. coal and gas, gas and hydrogen, coal, and biomass etc.). Application of the standard to individual units allows for greater accountability and transparency of the transition. It also enables continuous monitoring even as the units change operators. As an example, the emissions regulations for coal-fired generation are unit-based.

[10] Province of Alberta, *Emissions Trading Regulation, Alberta Regulation 33/2006*. https://www.qp.alberta.ca/1266.cfm?page=2006_033.cfm&leg_type=Regs&isbncln=9780779827169

[11] Myles Allen et. al. *The Oxford Principles for Net Zero Aligned Carbon Offsetting* (University of Oxford, 2020). https://www.smithschool.ox.ac.uk/publications/reports/Oxford-Offsetting-Principles-2020.pdf

c. What constraints or limitations should be incorporated into flexibilities?

In addition to the eligibility constraints for flexibilities described at the start of this section, the following limitations are essential to ensuring substantive reductions in GHGs in the electricity sector:

- There must be a limit on the amount of usage of compliance flexibilities for any single compliance year. This limit should become increasingly stringent over time and must be particularly stringent by 2035.
- Credits and offsets should expire after a predetermined number of years.

6. Under what conditions should offset credits available through federal, provincial/territorial, or other programs be permitted?

The criteria for the type of reductions that could generate these offsets would be similar to those discussed under Question 5.

7. To what extent can negative emission technologies like BECCS and DAC contribute to meeting the obligations of a CES regulation? To what extent should they be allowed to contribute to meeting those obligations?

Negative emissions technologies can help generate offsets or credits to help meet obligations under the CES regulation, as long as they:

- Are reliably carbon-negative
- Provide permanent emissions removal.

8. Should compliance be assessed for the electricity sector on an annual or multi-year basis?

Compliance should be assessed on an annual basis similar to the regulations for coal- and gas-fired electricity generation. There is great urgency to get to a net-zero grid by 2035, and Canada's electricity sector needs to show reliable progress towards decarbonization every year.

Alignment with carbon pricing

9. Should the way in which electricity generation is currently treated by carbon pricing be changed to facilitate achieving NZ2035?

Yes, the current Output-Based Pricing System (OBPS) for the electricity sector is not appropriate as the sector itself is not trade-exposed and cost-effective alternatives to emitting

technologies are commercially available and deployed. There is no rationale from a competitiveness or leakage perspective to provide carbon pricing subsidies to electricity generators. In addition, the construction of new gas plants and plans to expand existing gas capacity are an indication that the current carbon pricing scheme is not sending an effective enough signal to investors.[12]

10. How might the treatment of electricity under the OBPS have to change to align with the CES?

We recommend that the electricity sector be removed from the OBPS, and all of its emissions be exposed to the carbon price. This will more closely reflect the true cost of carbon and drive more rapid investments in clean energy technologies to get to a net-zero grid by 2035.

The carbon price revenues from the electricity sector could be recycled back into the sector and/or used to help lower the cost of electricity for consumers.

Treatment of natural gas generation

11. What is the role of natural gas in a net-zero electricity sector before 2035? Post-2035?

Gas-fired electricity generation is responsible for both emissions in the electricity sector and for upstream emissions from natural gas production and distribution, including fugitive emissions. As such, the role of gas in the electricity sector should be minimized as much as possible in order to reduce economy-wide and electricity-specific emissions.

In addition, a portfolio of clean energy solutions including renewables, storage, demand-side management (DSM), energy efficiency, and transmission interties can provide the same energy services as natural gas power plants — and additional reliability services — at a lower cost.[13]

The CES should be designed to be stringent enough to avoid new gas-fired generation plants and to facilitate the retirement of existing gas capacity. Leading up to 2035, gas should play a steadily diminishing role in the electricity sector as renewables, storage, DSM, and transmission are deployed. After 2035 there should be very minimal natural gas, all abated with CCUS.

[12] Jason Dion and Blake Shaffer, "Building on Canada's electrical advantage," *Canadian Climate Institute*, January 19, 2022. https://climateinstitute.ca/stronger-carbon-pricing-is-the-way-to-net-zero/

[13] Jan Gorski and Binnu Jeyakumar, *Towards a Clean Atlantic Grid: Clean energy technologies for reliable, affordable generation in New Brunswick and Nova Scotia* (2022). https://www.pembina.org/pub/towards-clean-atlantic-grid

12. What flexibility should be allowed to use natural gas to maintain reliability in rare and extreme weather, emergencies, or other special circumstances? Which additional operating conditions/scenarios, if any, should be given special consideration?

Deep decarbonization of the grid requires a system-wide approach to reliability rather than depending on any single generation technology. Transmission interties, storage, renewables, demand-side management, and energy efficiency need to be all deployed and leveraged to ensure system reliability at the lowest cost.

In the event that emitting technologies like gas-fired generation are in operation, they can avail themselves of the standard compliance flexibility mechanisms. Cost implications of this could be mitigated through measures outside the CES (such as recycling of carbon pricing revenue).

a. If natural gas has an electricity system-support role post-2035, what are the expected impacts on the rollout of emerging system support technologies such as energy storage?

The role of natural gas in supporting the electricity system will diminish as energy storage is deployed at scale along with transmission and demand-side management. From a system cost perspective, these alternative solutions to natural gas (particularly in combination) are much cheaper than natural gas. Currently, solar plus storage is outbidding natural gas in jurisdictions including California[14] and Arizona.[15]

Allowing unabated natural gas to operate in times of peak demand that are less exigent than true emergency situations would mean removing the most valuable price signals for storage investment. The broader the category of situations where unabated natural gas can be deployed, the weaker the investment signal for new storage and other clean energy alternatives.

[14] Clean Coalition, "Solar+storage is more cost-effective than proposed gas plants in Southern California," media release, September 7, 2017. https://clean-coalition.org/news/solarstorage-is-more-cost-effective-than-proposed-gas-plants-in-southern-california/; Emma Penrod, "Solar-plus-storage poised to become more financially attractive, but seasonal solutions remain key," *Utility Dive,* December 1, 2020. https://www.utilitydive.com/news/solar-plus-storage-poised-to-become-more-financially-attractive-but-season/589857/

[15] Brian Eckhouse, "Solar with Batteries Cheaper Than Gas in Parts of U.S. Southwest," *Bloomberg | Quint,* September 17, 2018. https://www.bloombergquint.com/business/solar-with-batteries-cheaper-than-gas-in-parts-of-u-s-southwest

b. If natural gas has a role in generation post-2035, what are the expected impacts on the penetration of nascent generation technologies like SMRs, geothermal electricity, etc.?

In a grid optimized for reliability, cost and GHG emissions reduction, gas-fired electricity usually has a very limited role.[16] If gas-fired generation is supported beyond the optimized level, it will prevent the penetration of more cost-effective and non-emitting technologies such as renewables, transmission interties, storage, and DSM. It will similarly hinder the penetration of nascent generation technologies.

Treatment of industry, private generation and remote generation

13. How should the CES treat electricity generated by cogeneration units that is sold to the electricity system? Should the CES apply fully to cogeneration units by 2035 or should it phase-in its application to cogeneration units after 2035?

For the electricity sector to be net-zero by 2035, all components of the electricity system must meet this requirement by 2035. Cogeneration facilities are a significant source of emissions, accounting for 22.3 Mt CO_2e or 3.3% of Canada's total emissions in 2020.[17] Moreover, cogeneration units are not limited to own-use applications: they are typically sized to the thermal/steam load of a facility and often generate much more electricity than the facility requires itself. In 2021, Alberta's cogeneration units represented around 30% of both the total generation capacity and the quantity of electricity exported to the grid.[18]

CES should apply fully to cogeneration units before 2035, following the timeline for intermediate standards outlined in Q1. Depending on the size of the electricity load of the industrial facility, there may be some flexibility and consideration applied to the component of the electricity output that supplies the facility. However, the electricity output into the grid must be treated the same as electricity supplied to the grid from other generators.

[16] Christopher Clack, "Reliable, Efficient & Low Carbon Resource Portfolios," presented at Future Power Markets Forum, June 2, 2020. https://vibrantcleanenergy.com/wp-content/uploads/2020/06/VCE-FPMF-06022020_LR.pdf

[17] Government of Canada, National Inventory Report 2022, Part 3, Table A10-3 (emissions for both heat and electricity), https://unfccc.int/documents/461919

[18] Alberta Electric System Operator, *2021 Annual Market Statistics*. https://www.aeso.ca/assets/Uploads/market-and-system-reporting/2021-Annual-Market-Stats-Final.pdf

14. What are the benefits of applying a CES to industrial generation units? What are the challenges of doing so? Of not doing so?

The CES should be applied to industrial generation units to ensure that all electricity generation is fairly covered by the standard. This would prevent the creation of a perverse incentive for more emitting behind-the-fence generation, which would impede the national emissions reduction goals for Canada.

Having considerations for smaller generating units, as outlined in Q16, might help manage costs for smaller industrial facilities.

15. How should the CES consider electricity generation in remote, northern, and Indigenous communities?

Consideration and engagement with remote and northern communities and Indigenous stakeholders should occur to gain insight into whether the CES should apply to remote, northern, and Indigenous communities in a similar manner to other generating facilities. A combination of incentives as well as regulatory requirements are needed in order to reduce the reliance of these communities on diesel. Current incentives and government programs, although effective, are still inadequate to drive significant diesel reduction in these communities. Between 2015 – 2022, despite the implementation of renewable energy projects, diesel consumption has in fact increased from 655 million litres of diesel-equivalent in 2015 to 682 million litres of diesel-equivalent in 2020.[19] The hydro grid in Yukon and the two electricity grids in the Northwest Territories, although predominately hydro-based, do have diesel and natural gas peaking / backup facilities that should definitely be included in the CES standard.

In including remote, northern and Indigenous communities in the CES, a few key measures are essential:

- The consultation in designing the standard and any equivalencies should ensure alignment with community priorities through meaningful and continuous collaboration in policy design.
- Additional programs and supportive policies should be made available to ensure affordability and minimize cost of living impacts.
- The process should uphold the principles of the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) legislation.
- Bilateral discussions between federal and territorial/provincial governments to ensure that technologies used to reach a net-zero emissions electricity system are financially

[19] Dave Lovekin et al., *Diesel Reduction Progress in Remote Communities* (Pembina Institute, 2020), 2, 1. https://www.pembina.org/pub/diesel-reduction-progress-remote-communities

and technically feasible within the proposed time frame and that adequate financial support will be provided for the transition.

16. How should the CES consider distributed energy resources?

Distributed Energy Resources (DER) will be particularly important as the grid progresses towards deep decarbonization and as electrification of end uses increases. DERs can provide flexibility and resiliency to the grid, as well as help lower the total cost of electricity.

For small emitting generating sources, there may be some allowance to have a higher emission standard at the start and have the standard decline to zero by 2035.

Treatment of biomass

No comments. Pembina has not conducted any recent research on biomass and lifecycle impacts of biomass combustion for electricity.

17. If CO_2 emissions from biomass combustion are not counted towards compliance under a CES, to what degree might biomass generation increase?

18. What types of biomass are suited to electricity generation? What are their characteristics with respect to regenerative life cycle, non-CO_2 GHG emissions, and land use characteristics?

19. What emissions reporting and compliance requirements for biomass generation should be considered to ensure that nature is protected and land-based emissions do not increase?

Other questions

20. What additional investments are anticipated to be necessary to achieve NZ2035 to help ensure affordability for consumers?

In addition to the CES setting a strong regulatory path to a net-zero grid by 2035, several additional investments are needed to ensure expedient decarbonization, reliability, and affordability. These investments should prioritize support for cost-effective solutions that result in credible emissions reductions (see Figure 1 below for the comparison in the latest IPCC report between the cost and potential of various mitigation options). The government should also look to leverage private sector finance and carbon pricing revenues to support these investments.

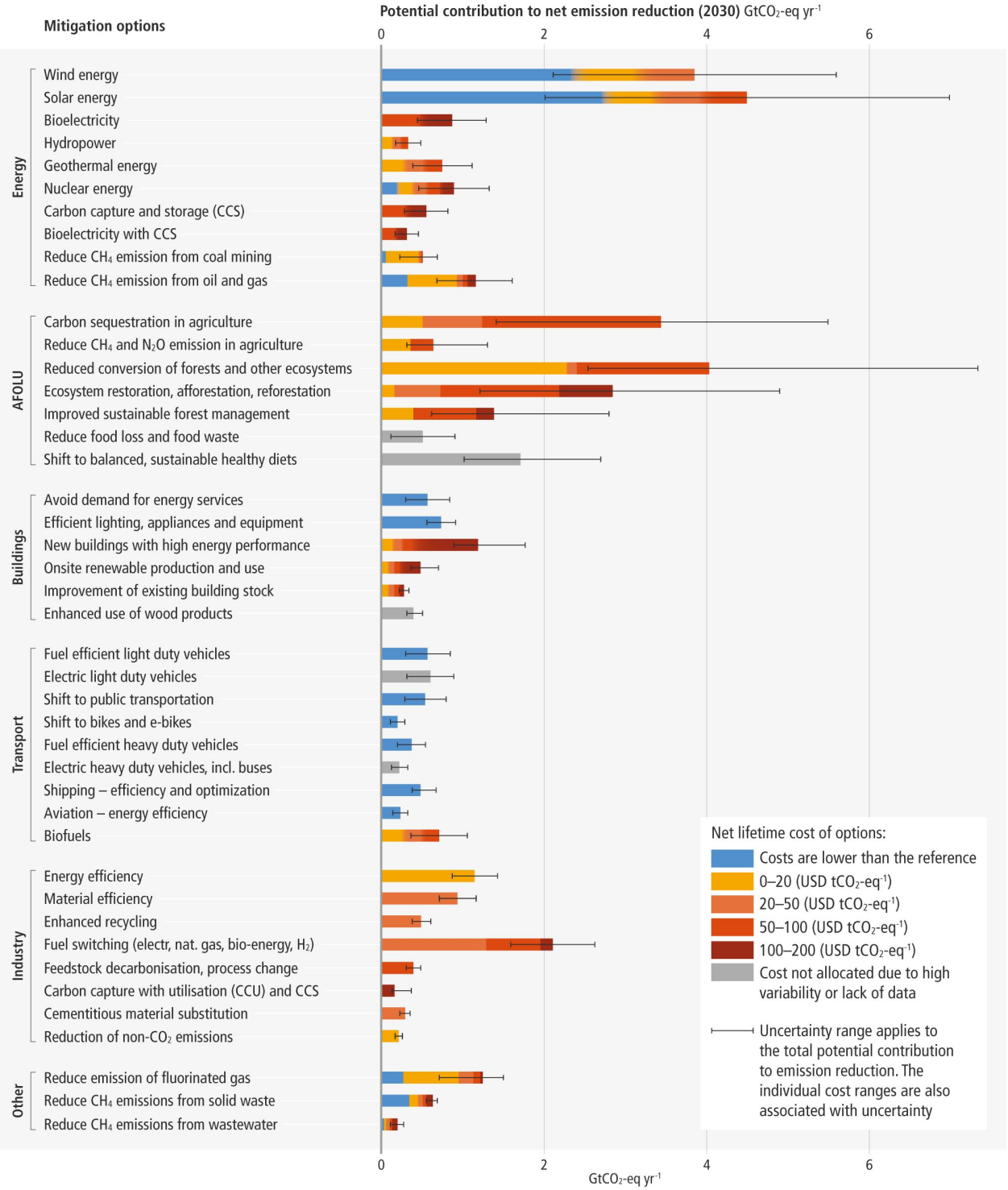

Figure 1: Cost and emissions reduction potential in 2030 of various mitigation options

Source: IPCC[20]

[20] IPCC, *Climate Change 2022: Mitigation of Climate Change: Summary for Policymakers,* Figure SPM.7. https://report.ipcc.ch/ar6wg3/pdf/IPCC_AR6_WGIII_SummaryForPolicymakers.pdf

Transmission

Study after study has shown that interjurisdictional transmission interties help reduce the total system cost of grid decarbonization.[21] Federal government investment and support is needed to build transmission infrastructure as well as to support provinces in reaching bilateral and multilateral agreements. Such agreements and projects have long lead times, so it is critical that initiatives to enable them – such as the Pan-Canadian Grid Council – be ambitious and start immediately.

Energy Efficiency and Demand Side Management

Despite energy efficiency being the most cost-effective way to reduce demand and emissions from electricity,[22] these programs are still in need of significantly expanded support. As of the 2022 Emissions Reduction Plan, the federal government has only committed around $6 billion to residential and commercial building retrofits programs. Pembina's work found that $10-15 billion per year of federal funding until 2030 for such measures is necessary to reach net-zero,[23] which will save consumers $10.8 billion a year in energy costs in 2050. A similar Council for Clean Capitalism report found that $14.7 billion invested until 2030 can unlock $209 billion in private sector and other investments, saving Canadians $12.5 billion over that time in energy costs.[24]

Support storage deployment at scale

A net-zero grid will require a significant amount of storage technologies. While the cost of battery storage continues to plummet,[25] storage is not yet deployed in Canada at the pace that is required. There is a need for funding support as well as support to system operators for integrating storage. Moreover, regulatory and planning systems need substantial reform to account for the many benefits of energy storage that can help to avoid system and wires costs,

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[21] National Renewable Energy Laboratory, "North American Renewable Integration Study." https://www.nrel.gov/analysis/naris.html

[22] Benjamin Israel, "Carbon capture can't beat energy efficiency," *Pembina Institute,* December 6, 2016. https://www.pembina.org/blog/carbon-capture-cant-beat-energy-efficiency

[23] Madi Kennedy and Tom-Pierre Frappé-Sénéclauze, *Canada's Renovation Wave: A plan for jobs and climate* (Pembina Institute, 2021). https://www.pembina.org/pub/canadas-renovation-wave

[24] Ralph Torrie, Céline Bak, Toby Heap, *Building Back Better With A Bold Green Recovery* (Council for Clean Capitalism, 2020), https://www.corporateknights.com/wp-content/uploads/2021/02/2020-09-14-Building-Back-Better-with-a-Bold-Green-Recovery_FINAL_enfr.pdf

[25] Amol Phadke et al., *Why Regional and Long-Haul Trucks are Primed for Electrification Now* (Berkeley Lab, 2021), Figure ES1. https://eta-publications.lbl.gov/publications/why-regional-and-long-haul-trucks-are; Bloomberg NEF, "Battery Pack Prices Cited Below $100/kWh for the First Time in 2020, While Market Average Sits at $137/kWh," December 16, 2020. https://about.bnef.com/blog/battery-pack-prices-cited-below-100-kwh-for-the-first-time-in-2020-while-market-average-sits-at-137-kwh/

along with integrating variable renewable energy and supporting system reliability and ancillary services.

Support regulatory reform in provinces

In order to ensure that clean energy technologies are not only installed but also optimally utilized, electricity market and transmission and distribution regulations need to be updated in most jurisdictions. Currently utilities have inadequate incentives to deploy energy efficiency, DER, DSM, and other clean energy solutions at the pace and scale needed. Similarly, most jurisdictions don't have adequate incentives for consumers (particularly through the rate structure) to invest in clean energy solutions.

Support for low-income households

Low-income households are often more vulnerable to the impacts of climate change and to potential short-term cost increases from energy transition. At the same time, they often have less access to technologies that can directly reduce everyday costs such as rooftop photovoltaics, public zero emission vehicle chargers, and energy efficiency retrofits, which tend to be predominantly installed in more affluent neighbourhoods.[26,27,28,29]

Households with lower incomes are more likely to have older appliances.[30] The Greener Homes Grant and Loan program should expand its low-income stream to include upgrading appliances. An estimated 6-19% of Canadian households live in energy poverty[31] that could be partly alleviated by the program.

All public programs should ensure access to these technologies is equitable. Capital cost and interest rebate programs and loan loss guarantees for lenders targeted at households or

[26] François Tardy and Bruno Lee, "Building Related Energy Poverty in Developed Countries – Past, Present, and Future from a Canadian Perspective," *Energy and Buildings* 194 (2019). https://doi.org/10.1016/j.enbuild.2019.04.013.

[27] NREL, "NREL Draws on Experience to Expand Equitable Energy Access to State, Local, and Tribal Communities," March 29, 2021. https://www.nrel.gov/state-local-tribal/blog/posts/nrel-draws-on-experience-to-expand-equitable-energy-access-to-state-local-and-tribal-communities.html

[28] Naïm R, Darghouth, Eric O'Shaughnessy, Sydney Forrester, and Galen Barbose, "Characterizing Local Rooftop Solar Adoption Inequity in the US," *Environmental Research Letters* 17, no. 3 (2022). https://doi.org/10.1088/1748-9326/ac4fdc

[29] Evana Said, Jillian Neuberger and Carla Walker, "The US Clean Energy Transition Isn't Equitable — But it Could Be," *World Resources Institute,* November 29, 2021. https://www.wri.org/insights/achieving-equitable-us-clean-energy-transition

[30] American Council for an Energy-Efficient Economy, "Supporting Low-Income Energy Efficiency: A Guide for Utility Regulators," April 28, 2021. https://www.aceee.org/toolkit/2021/04/supporting-low-income-energy-efficiency-guide-utility-regulators

[31] Mylene Riva et al., "Energy Poverty in Canada: Prevalence, Social and Spatial Distribution, and Implications for Research and Policy," *Energy Research & Social Science* 81 (2021). https://doi.org/10.1016/j.erss.2021.102237.

communities with lower income can also improve affordability for these groups. Greater engagement of and participation by local communities in decision-making processes are also needed to enable equity.

Support for remote and Indigenous communities

Remote, Indigenous communities experience the highest energy costs in the country.[32] As such, any changes to the electricity system should ensure that cost increases are not passed on to consumers. Inevitably, implementing net-zero electricity systems will require upfront capital investments. Government funding is needed to address these costs, shifting current subsidies from supporting diesel reliance towards supporting clean energy technologies. It should be acknowledged that while renewable energy systems will require upfront funding support, operational costs are avoided, further incentivizing the move off of diesel.

Consumer cost management can also be facilitated through increasing the availability of energy efficiency programs and funding. Funding amounts must reflect the high costs of construction in remote communities compared to urban environments. When implementing new programs, Canada should ensure community capacity development and increased economic opportunities. Clean energy systems should be driven and owned by Indigenous people and communities to ensure that communities experience the full benefits of implementation.

21. What role could existing and expanded energy efficiency programming play in helping to meet new demand as they transition towards net-zero 2035? What are the constraints for additional efficiency measures? Technological? Policy? Other?

Energy efficiency has a significant role to play in reducing emissions and avoiding generation capacity additions. The latest IPCC report has noted that energy efficiency can significantly help to negate the increased electricity demand from electrification of other energy end uses globally.[33] Efficiency Canada estimated that even today, 9.3% of Canada's final electricity demand could be reduced through deep retrofits — even after accounting for new demand from

[32] Dave Lovekin, *Diesel Subsidies – Simplified, Part I* (Pembina Institute, 2021). https://www.pembina.org/pub/diesel-subsidies-simplified-part-i

[33] *Mitigation of Climate Change: Summary for Policymakers*, Figure SPM.6.

heat pumps.[34] An Energy Efficiency Alberta study estimated reductions can reach much as 13.3% of Alberta's electricity demand, or 919 MW, in 2038.[35]

The primary barriers for energy efficiency are policy and regulatory constraints. Most rate structures have not yet decoupled profits from energy sales, so most utilities do not have incentives to encourage investment in energy efficiency measures.

22. What other factors should the government consider in developing the CES?

CES is not the solution to all net-zero grid concerns

Many of the concerns raised by stakeholders — particularly around affordability, standard assets, and reliability — are best addressed through separate programs, incentives and regulatory reform that would be external to the CES. The more streamlined, clear, unambiguous, and stringent the CES is, the better it is at sending an effective signal to industry and at building credibility among investors and the global community for Canada's decarbonization efforts.

Robust equivalency agreements

The federal government needs stringent protocols to protect the CES against weakening via equivalency agreements.

- The baseline federal CES regulation scenario must be accurate. In the case of the federal coal phase-out regulation, the equivalency analysis assumed higher than actual emissions from replacement generation, and as a result was overly permissive in what emissions reductions were required from the provincial policies to achieve "equivalency."
- The co-benefits of reduced GHG emissions from the electricity sector that are cited as additional rationales and cost savings for the policy in the Regulatory Impact Assessment Statement (such as air quality, additional environmental outcomes, reduction in upstream emissions) should be taken into consideration, not just the primary regulatory outcome, which has been cited as GHG emission reductions. With the coal phase-out equivalency agreements, these co-benefits were sacrificed, despite that they were cited as positive and cost-saving outcomes of the coal regulations.

[34] Brendan Haley and Ralph Torrie, *Canada's Climate Retrofit Mission* (Efficiency Canada, 2021) https://www.efficiencycanada.org/wp-content/uploads/2021/06/Retrofit-Mission-FINAL-2021-06-16.pdf

[35] Energy Efficiency Alberta, *2019-2038 energy efficiency and small-scale renewables potential study: Final report*, prepared by Navigant Consulting (2018), 32, https://open.alberta.ca/publications/energy-efficiency-alberta-2019-2038-energy-efficiency-and-small-scale-renewables-potential-study

- The flexibility of the equivalency agreement should not undermine Canada's national commitment to a net-zero grid. Climate change is a global problem, requiring international action and cooperation. It is critical that Canada's grid is credibly net-zero by 2035.
- The federal government must be transparent around the assumptions, inputs, and outputs of its equivalency assessment model.
- The process of establishing the equivalency agreement should include consultation with stakeholders and civil society.

Additional recommendations for equivalency agreements can be found in the position paper by Climate Action Network Canada and other Canadian environmental non-governmental organizations, *Setting Expectations for Robust Equivalency Agreements in Canada.*[36]

Data availability and transparency

The CES should require annual unit-level reporting of GHG emissions. Currently, unit-level emissions data is not available for most provinces. This is against best practices for emissions reporting and makes it difficult to track the exact transition within different facilities and to hold utilities accountable to their public commitments.

Parallel implementation of programs to support provinces and consumers

The investments and programs suggested in the response to Q20 on affordability and additional efforts to support particularly difficult-to-decarbonize provinces should be planned for and communicated at the same time as the CES. This will enable all impacted stakeholders to understand the net costs and benefits to them from the grid decarbonization efforts. It will also allow for informed decision-making, build confidence in the pathway to a net-zero grid, and help avoid new investments in assets that may become stranded.

Support for equitable transition for impacted workers and communities

The transition to a net-zero grid may have substantial impact on many workers and communities that are particularly reliant on emitting energy sources for employment and revenues. Building from the experience of Canada's just transition support for coal workers and communities as coal phase-out policies were implemented, the following considerations must be part of equitable transition efforts that parallel the decarbonization of the grid:

[36] Karine Péloffy et al., *Setting Expectations for Robust Equivalency Agreements in Canada* (Climate Action Network Canada, 2019). https://climateactionnetwork.ca/wp-content/uploads/2019/04/CAN-Rac-Equivalency-Paper-2019-web.pdf

- Set clear targets and pathways toward decarbonization and communicate information to stakeholders in a timely manner. Clear communication about the pace, goals, and pathways of the energy transition measures provides the certainty needed for affected workers, communities, and industries to plan their futures.
- Involve all stakeholder groups early in transition negotiations. Early participation is essential for crafting just transition policies that address the challenges faced by workers and communities most affected by the energy transition.
- Include transition financing mechanisms in decarbonization policy design. A steady source of funding should be used to ensure the overall stability of just transition initiatives.
- Prioritize impacted communities in clean energy procurement programs. Governments and utilities need to prioritize purchasing renewable energy from former coal communities, with a focus on community and Indigenous project ownership.