



Canadian Nuclear Workers' Council

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May 12, 2023

Ministry of Energy, Energy Supply Policy Division
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Submission to the Environmental Registry of Ontario Consultation ERO Number 019-6647, regarding IESO "Pathways to Decarbonization Study"

To whom it may concern:

The Canadian Nuclear Workers' Council (CNWC) has been the collective voice of Unionized Workers across Canada's nuclear industry for 30 years. Our Affiliated Unions represent Workers who mine and refine uranium, manufacture nuclear fuel, operate and maintain Canada's nuclear power plants (NPP), construct and refurbish NPPs, produce medical isotopes, carry out nuclear research and development, manage our nuclear waste and ultimately decommission our nuclear facilities.

On the matter of electrification, most of the Labour Unions that represent the Workers directly involved in generating the bulk of Ontario's electricity are CNWC Affiliates. CNWC Affiliates also represent workers at local distribution companies across Ontario, the IESO itself, and at the Ontario Energy Board. This involvement in all aspects of electricity generation provides a unique perspective on the sector as a whole.

The CNWC appreciates the opportunity to comment on and provide input to the Ministry of Energy's consultation on the IESO's "Pathways to Decarbonization Study" (P2D).¹ The Ministry of Energy seeks feedback on the findings of P2D and particularly the IESO's "no regret" recommendations contained in it. P2D was undertaken to assess the upshot of a hypothetical moratorium on gas-fired power generation. P2D, and the Ministry of Energy's Electrification and Energy Transition Panel, "will help inform the government's next steps toward its longer-term vision for an integrated energy system."

The CNWC strongly supports rational, informed planning and decision-making in the Ontario electricity sector, and recognizes and appreciates IESO's central role in these activities. CNWC notes several issues in the study regarding security of supply in the near to medium term, cost implications of IESO's "no regret" recommendations, and readiness of the Ontario electricity system to meet the demands of electrification. These are discussed in detail in this submission.

Again, we appreciate the opportunity to offer feedback, and we hope the Ministry finds our suggestions useful.

Sincerely,
Bob Walker,
National Director

P.S. All CNWC policy positions can be found at <https://cnwc-cctn.ca/>

¹We refer to the consultation process published at <https://ero.ontario.ca/notice/019-6647>

Canadian Nuclear Workers' Council (CNWC) Submission to the Ontario Ministry of Energy regarding IESO's "Pathways to Decarbonization Study"

May 12, 2023

The Ontario Ministry of Energy seeks feedback on the "no regret" recommendations given in the Independent Electricity System Operator (IESO) study "Pathways to Decarbonization" (the P2D Study), which was prepared in response to the Ministry's request in October 2021 that the IESO develop an achievable pathway to a zero-emitting electricity sector. The Ministry's request was itself a response to the IESO study "Gas Phase-Out Impact Assessment," which had been released earlier in the Fall of 2021.

CNWC is pleased to offer comments and provide feedback on the Ministry of Energy's consultation on the P2D Study, as part of the preliminary process to develop an integrated energy plan to ensure Ontarians have adequate supplies of reliable, affordable, clean energy. We strongly support rational, deliberative, and timely reform of the Ontario electricity sector, as the sector faces both a shortage of supply to meet current demand and the need to address demand increases due to electrification and public concern over climate change. The electricity sector is literally the mainstay of Ontario's and Canada's economy and society, and CNWC salutes IESO as the primary entity driving this needed reform.

IESO's P2D study, published December 15 2022, assesses that the high electrical demand from electrification, together with mandatory emissions constraints, will by 2050 result in electrical demand peaks roughly three times those of today. This reflects the view of some in the industry, including the Power Workers' Union (PWU), a CNWC Affiliate, that previous estimates outlined in IESO Annual Planning Outlooks were insufficient.

IESO's assessment that 2050 will see a requirement of 69,000 MW of zero-emitting capacity is roughly in line with CNWC's own assessment. We fear, however, that most people may miss the very daunting implications of this figure. Simply linearly projecting from today's capacity mix, Ontario would need to build at least 20,000 MW of new nuclear, inside the span of 27 years. While this province achieved almost exactly that feat between 1968 and 1995, today's regulatory environment is more comprehensive. To achieve 20,000 MW new nuclear over the next 27 years, Ontario must begin now. We worry this urgency is understated in the P2D study.

Further, CNWC worries there is too much emphasis in the P2D Study on approaches to securing major bulk electrical supply that can by their nature yield only marginal results and at very high cost. These approaches include long-duration storage, variable renewable energy, "low carbon" combustible fuels like biomass, and hydrogen. Time and effort are more properly dedicated to bulk non-emitting supply sources that have proven to work through all demand conditions, over decades, at affordable cost.

In light of the seriousness of the coming non-emitting bulk supply crunch, CNWC urges that IESO reconsider options for seeking extension of Pickering B in terms of an assessment of the Equivalent Full Power Hours (EFPH) status for each of the reactors. If such an assessment were to find that the EFPH limit for each of these four 515MW units could indeed be safely extended, valuable time could be bought to procure replacement bulk zero-emitting capacity. Moreover, this could provide to Ontario Power Generation an economically viable case to continue operating Pickering units 1 and 4, thus keeping a further 1,100 MW in the system at least until Pickering B units reach the new EFPH limit.

Please find below CNWC's comments on IESO P2D study.

The following are CNWC's responses to Questions 1 through 9 in the Environmental Registry of Ontario "IESO Pathways to Decarbonization Study" consultation page. Our responses are numbered to correspond with the ERO's numbered questions.

1. The IESO's Pathways Study recommends streamlining regulatory, approval and permitting processes, citing that it can take five to 10 years to site new clean generation and transmission infrastructure.

Consultation question What are your thoughts on the appropriate regulatory requirements to achieve accelerated infrastructure buildout? Do you have specific ideas on how to streamline these processes?

CNWC response CNWC fully supports regulations and approvals intended to help protect people and the environment. That being said, we are also in full support of efforts to help streamline processes and eliminate any duplication. Environmental and other criteria must be fully assessed but that assessment needs to be completed within a reasonable timeframe. This requires direction and cooperation from senior levels of government.

2. The IESO's Pathways Study recommends beginning work on planning and siting for new resources like new long-lived energy storage (e.g., pump storage), nuclear generation and waterpower facilities.

Consultation question What are your expectations for early engagement and public or Indigenous consultations regarding the planning and siting of new generation and storage facilities?

CNWC response Nuclear energy has by far the smallest physical footprint on the land. CNWC believes that this characteristic makes nuclear by far the most viable expandable power generation technology. Nuclear capacity in Ontario could be expanded significantly, simply by adding new capacity at existing nuclear generation sites in this province. Another 4,000 MW could be added to the now-decommissioned Nanticoke site on Lake Erie, again without expanding current land use at all.

On the matters of pumped storage and waterpower, CNWC would like to share the following points:

- 2.(i) Pumped storage opportunities in Ontario are already being pursued, at TC Energy's Meaford facility. This facility represents Ontario's only viable site for this technology. Chemical batteries of similar capacity to TC Energy Meaford (1,000 MW) are much too costly and should not be pursued. CNWC does believe chemical storage batteries have a decisive role to play in Ontario's energy future, but not at grid scale, and not for the purpose of balancing/stabilizing the grid.²
- 2.(ii) The scope of what is considered "energy storage" should be expanded, to include thermal mass storage (in building concrete and drywall) and domestic hot water (DHW). The latter especially has large scale potential, and important implications in the area of grid stability.

²Battery-electric vehicles (BEVs) would be a major component of decarbonization-by-electrification, and would carry significant implications for grid management. However, this relates to power flow from the grid to batteries, not from batteries to the grid. Please see CNWC's [Electrification Policy Position series](#).

2.(iii) Viable waterpower sites in Ontario were exploited decades ago. While some potential may exist in the northern areas of the province, CNWC believes exploiting it would necessitate physically altering unacceptably large tracts of sensitive Boreal forest, and would likely come at an unacceptable cost for energy consumers. Indigenous groups who inhabit in the northern regions of the province, and who draw economic value and spiritual strength from the land in its natural state, are the ones who will directly feel the adverse impacts of massively expanded land use resulting from significant further hydropower development in the north.

3. The IESO's Pathways Study shows that natural gas-fired generation will need to continue to play an important role in the system for reliability in the short to medium term. The IESO's assessment shows that most of the projected Ontario demand in 2035 can be met with the build out of non-emitting sources, but some natural gas will still be required to address local needs and provide the services necessary to operate the system reliably.

Consultation question(s) Do you believe additional investment in clean energy resources should be made in the short term to reduce the energy production of natural gas plants, even if this will increase costs to the electricity system and ratepayers? What are your expectations for the total cost of energy to customers (i.e., electricity and other fuels) as a result of electrification and fuel switching?

CNWC response The question "Do you believe additional investment in clean energy resources should be made in the short term to reduce the energy production of natural gas plants, even if this will increase costs to the electricity system and ratepayers" is an important one. Briefly, our answer is yes—but with a major cost-related caveat. Any new generation constructed in Ontario should be non-emitting, but we should not pursue non-emitting electricity at any price, as was done in the past. CNWC believes it is vitally necessary to distinguish between clean energy resources, as they are not equal. The major types are nuclear, hydro, wind and solar. Nuclear and hydro can and have powered grids the world over. Wind and solar require significant amounts of synchronous generation in order to be viable. Further:

3.(i) Analysis of IESO generation, demand, and export/import data shows significant swings in wind output especially. These swings generally do not correspond with hourly and daily seasonal patterns of electrical demand on business days and weekends/holidays, nor with weekly and monthly patterns. Needless to say, they also mean wind is not an appropriate source of baseload supply. While average wind output-to-capacity ratios settle around 30–35 percent, there are high standard deviations in output, which the IESO must balance from moment to moment. Import/export interties—particularly those at the borders of Quebec, New York, and Michigan—appear to play a major role in this balancing, as do the hydro facilities in the Niagara, Upper Ottawa, and Madawaska River systems, and OPG's CCGT gas plants. Solar, of course, is a "mode zero" generation source, with high variability of diurnal output that also presents balancing challenges.

3.(ii) This analysis suggests that Ontario already has excessive wind and solar capacity even for current electrical demand conditions, which further suggests wind and solar should not play a role in the expansion of clean energy. This leaves nuclear and hydro as the only viable alternatives to meeting future (elevated) electrical demand with non-emitting supply.

3.(iii) As discussed in 2.(iii) above, Ontario’s hydroelectric system was developed in an era of poor provincial and utility treatment of the indigenous inhabitants of the areas affected by hydroelectric development. These inhabitants were not adequately compensated for this disruption; consequently Ontarians were able to pay artificially low rates for the hydroelectricity that was produced in the affected areas. Rates for newly developed hydroelectricity would be significantly higher than what Ontarians pay for the electricity from the “legacy” hydro plants.

3.(iv) This raises two important questions: would the “game be worth the candle,” environmentally speaking, in the case of new hydro in Northern Ontario; and would the higher hydro rates be higher or lower than those for new nuclear?

4. The IESO’s Pathways Study highlights emerging investment needs in new electricity infrastructure due to increasing electricity demand over the outlook of the study. The IESO pathway assessment illustrates a system designed to meet projected demand peaks almost three times the size of today by 2050, at an estimated capital cost of \$375 billion to \$425 billion, in addition to the current system and committed procurements. Please see supporting materials for illustrative charts on capacity factor and cost by resource type.

Consultation question Are you concerned with potential cost impacts associated with the investments needed? Do you have any specific ideas on how to reduce costs of new clean electricity infrastructure?

CNWC response CNWC believes high electricity costs present an economic barrier to the “fuel switching”—i.e. switching away from gasoline, diesel, and natural gas to grid electricity—that is the basis of electrification. CNWC wishes to make the following points in this regard.

4.(i) Ontario in the past decade and a half inserted significant amounts of very high cost, low-efficiency generation into its grid, along with transmission infrastructure dedicated to that generation. For Class B electricity end users, this has resulted in a significant price spread between natural gas, which costs roughly 5 cents per kilowatt hour (including carbon tax), and electricity, which costs roughly 26 cents per kWh for residences in urban Ontario.³

4.(ii) This price spread makes currently priced natural gas, a carbon emitting fossil fuel, much more economically attractive than very-low-emitting Ontario grid electricity, and likely explains why electric residential space heating in Ontario has declined sharply relative to natural gas-fired heating. This undercuts the aim of decarbonization by electrification. Moreover, grid electricity is now priced much higher in Ontario than it is in Canadian provinces and U.S. states that compete with Ontario for industrial investment.

4.(iii) We should not repeat this mistake.

4.(iv) To mitigate cost impacts of new electricity generation, CNWC strongly supports implementing economies of scale in both generation and transmission, as this approach has so far proven the only reliable way to keep prices down for consumers while reasonably maintaining the financial viability of the generating and transmitting/distributing entities.

5. The IESO’s Pathways Study recommends that for a zero-emissions grid by 2050, investment and innovation in hydrogen (or other low-carbon fuels) capacity could be required to replace the flexibility that natural gas currently provides the electricity system.

³In 2009, the all-in urban residential per-kilowatt-hour price of Ontario electricity was roughly 14 cents.

Consultation question Do you have any comments or concerns regarding the development and adoption of hydrogen or other low-carbon fuels for use in electricity generation? What are your thoughts on balancing the need for investments in these emerging technologies and potential cost increases for electricity consumers?

CNWC response Hydrogen, unless derived from water via electrolysis, does not represent any improvement over direct use of fossil fuels for energy. The only proven non-electrolysis method for producing bulk hydrogen is steam methane reformation (SMR). SMR releases significant CO₂ and is therefore not a “net zero” solution.

If hydrogen *is* derived from water electrolysis, the electricity that energizes the process must be zero-emitting. Again, only bulk electricity providers can economically electrolyze water at scale. The following implications flow:

5.(i) This narrows the field of zero-emitting candidates for large-scale electrolysis to nuclear and hydro, the latter of which again raises the question of whether it is advisable, from the perspective of environmental stewardship and indigenous relations, to submerge large tracts of northern Boreal forest for hydropower. See again 2.(iii).

5.(ii) This leaves nuclear as the only viable candidate to provide the bulk 24/7 energy for large-scale electrolysis.

5.(iii) However, at this point the question becomes, why use high-quality electricity to produce low efficiency hydrogen only to convert that hydrogen back into electricity. Could simply accepting a lower annual nuclear fleet capacity factor provide the flexibility to assure demand peaks are met? If the P2D Study’s estimated requirement of 69,000 MW of non-emitting capacity for 2050 is correct, then the nuclear component of that would approach 32,000 MW. Accepting a fleet CF of 85 percent would make 4,800 MW available.

5.(iv) “Low carbon” fuels for power generation, hydrogen or other, have been studied extensively for many decades, under a plethora of government science R&D funding programs not just in Canada (and every Canadian province) but across the entire Developed World. The only “low carbon” bulk generation that has resulted is biomass (usually wood pellets) replacing coal in Rankine Cycle plants. While coal-to-biomass conversions have utility in some areas, such as northern Ontario, the opportunities are very limited and Ontario has already exploited them. In terms of Criteria Air Contaminants associated with power generation, “low carbon” technologies are typically not cleaner than coal and are usually much more pollution intensive. CNWC believes chasing this red herring will only consume time and resources better spent elsewhere.

6. The IESO’s Pathways Study recommends greater investment in new non-emitting supply, including energy efficiency programs.

Consultation question Following the end of the current 2021–2024 energy efficiency framework how could energy efficiency programs be enhanced to help meet electricity system needs and how should this programming be targeted to better address changing system needs as Ontario’s demand forecast and electrification levels grow?

CNWC response Focusing on energy efficiency and conservation while aiming for 69,000 MW of zero-emitting generation, of which roughly 40,000 would have to be built between now and 2050, may seem confusing to the public. Province-level conservation efforts over past decades have focused almost exclusively on electricity usage. But electrification would entail *greater* electricity use, and lesser combustible fuel use, as energy consumers switch “fuels” in response to climate change and clean air considerations, and, one would hope, lower prices. In almost all cases, electrification will result in less *energy* use, and thereby already has dramatic conservation built into it.

CNWC feels it would send a contradictory message, and could even be counter-productive, to actively encourage electricity conservation while at the same time encouraging consumers to use more electricity. Rather, electrification should be actively branded as energy conservation.

7. The IESO’s Pathways Study includes a scenario for over 650 MW of new large hydroelectric capacity to meet system needs in 2050. A recently released assessment estimates that there may be potential to develop 3,000 to 4,000 megawatts of new hydroelectric generation capacity in northern Ontario and 1,000 megawatts in southern Ontario.

Consultation question #1 What are your thoughts on the potential for development of new hydroelectric generation in Ontario by private-, Indigenous- and government-owned developers?

Consultation question #2 While the capital costs for hydroelectric generation may be higher than nuclear, wind, solar, and natural gas, do you support investing in large scale hydroelectric assets that may operate for over a hundred years?

CNWC response to both questions While new large hydro would be more costly than legacy hydro, there is value in it, as a flexible balancing resource particularly—a role that Ontario’s hydro fleet performs today in combination with imports/exports and CCGT output, as we point out in 3.(i). The balancing capability of hydropower is especially important in the context of greater electrical demand in the future. Provided there is strong buy-in from the indigenous communities who would be affected by the associated land-use disruption, and provided there is minimal impact on the vital and sensitive Boreal ecosystem, CNWC could support 650 MW of new large hydro.

8. The IESO’s Pathways Study suggest that significant transmission capacity will be needed to help balance intermittent sources of electricity (e.g., wind and solar) and to ensure cost-effective supply can be delivered to meet growing demands from electrification and economic growth. Transmission will also be required to balance intermittent supply with dispatchable supply (such as natural gas and energy storage) and meet demand in regions with retiring assets.

Consultation question What steps should be taken to ensure that transmission corridors can be preserved and lines can be built as quickly and cost effectively as possible?

CNWC response CNWC does not support expanding the transmission system to accommodate new wind/solar. Dedicating vital public infrastructure investment to low capacity factor resources whose essentially random output is inherently out of sync with minute-by-minute electrical demand makes little sense, from the perspective of either economics or grid stability.

In terms of transmission corridors, CNWC feels it is worth exploring if there is potential for expansion along the rail corridors that are not currently co-located with electricity transmission. This not only opens the possibility for freight rail electrification, but passenger as well. Much of Metrolinx's GO system is slated to be electrified, and there appear to be natural synergies, in terms of existing rights of way, with the AC transmission system. CNWC also believes extending grid electrification as far north as possible would bring the benefits of clean energy to Ontario's north. Provided the transmission corridors were developed with the support and collaboration of indigenous communities, CNWC could support this.

9. Do you have any additional feedback on the IESO's "no-regret" recommendations?

CNWC response CNWC would like to thank the Ministry of Energy for the opportunity to provide input and feedback to this consultation process, and we hope the Ministry will find our contribution useful. We would like to repeat and re-emphasize our concern that the urgency of the challenge before Ontario is under-appreciated, and that things are moving too slowly. We are encouraged the Ministry has asked for feedback, and hope it shares our concern. CNWC would also like to re-emphasize the need for energy regulatory authorities to clearly explain to Ontarians where electricity stands in the energy mix, and what the aims of electrification are.

CNWC supports work being done by the Government of Ontario to transition to a low carbon energy future. We fully support the clean energy projects that are already underway in Ontario including the ongoing refurbishments at Bruce Power and OPG Darlington, the construction of Canada's first small modular reactor (SMR), and all efforts to increase electrification. We know that Ontario's electricity system requires new non-emitting electricity generation to keep pace with expected demand growth. A supply deficit would be disastrous for our economy. To that end, CNWC supports refurbishing the Pickering B reactors and planning now for the construction of new CANDU.

Thank you for the opportunity to provide comments.

Sincerely,



Bob Walker
National Director, CNWC