



Canadian Nuclear Workers' Council

Conseil Canadien des Travailleurs du Nucléaire

Summer 2023

National Director's Message

We've recently seen a remarkable series of announcements from the Government of Ontario signaling their strong confidence in nuclear energy. This is a reflection of the impressive operating performance of Canada's nuclear power plants as well as the equally impressive progress of the nuclear refurbishment projects in Ontario.

The health and prosperity of all Canadians requires an abundant supply of clean, reliable and affordable energy. Our Federal and Provincial governments are investing in meaningful actions to reduce carbon emissions but we need to move quickly if Canada hopes to achieve net-zero by 2050. Electrification is an essential element of our clean energy transition but to make that possible we require an adequate supply of reliable, emission-free electricity.

Nuclear energy has been a significant source of clean and reliable electricity in Canada for decades. We know there is no pathway to net-zero without nuclear energy. With that in mind, Canada, as well as the Provinces of Alberta, Saskatchewan, New Brunswick and Ontario, are strategically pursuing the development and deployment of small, very small and micro modular reactors (SMRs). SMRs will be an important part of Canada's clean energy future but we know that jurisdictions like Ontario also require new large nuclear.

In their Pathways to Decarbonization Report, Ontario's Independent Electricity System Operator (IESO) recommended the construction of 18 GW of new nuclear by 2050. Ontario's current installed capacity of nuclear generation



CNWC National Director Bob Walker

is about 13 GW. Announcements at Bruce Power and OPG-Darlington are clear progress but much more is required. The construction of 18 GW is a huge undertaking which will require time, planning and preparation. Fortunately Canada already owns a proven solution, CANDU, and we've done this before.

CANDU is home grown technology designed with Canada's energy security in mind. CANDU components are manufactured in Canada and CANDU fuel is manufactured in Canada. That cannot be said for any other reactor design. Canada's nuclear industry knows CANDU very well as is being demonstrated by the successful progress of the refurbishments at OPG-Darlington and Bruce Power. Canada's nuclear regulator, the Canadian Nuclear Safety Commission (CNSC) and Canada's Nuclear Workforce all know CANDU very well. Canada currently has 19 operating CANDU Reactors and CANDU-6 reactors are operating worldwide. In three different jurisdictions, namely, Europe, China and Korea, CANDU-6 is a top performing reactor. The CANDU is a top performing reactor design in the world based upon the operating performance of the past decade.

Our **CAN**adian **D**euterium **U**ranium (CANDU) Reactor technology is the foundation of Canada's strong nuclear industry. CANDU is Canada's Nuclear Advantage.

We know that nuclear energy is important for our clean energy future. We also know that CANDU is important for Canada's energy security and provides many socio-economic benefits for Canada and Canadians. Our Federal and Provincial Governments have clearly acknowledged their recognition of the many benefits of nuclear energy. It's now up to Canada's nuclear industry to ensure they are ready to deliver.

None of the above comments are meant to diminish the important work being done to progress the development of SMRs. That will be explored further in future comments.

Bob Walker



Huge news: First large new build interest in a decade

Canada is in a headlong rush to decarbonize its economy. It is envisioned this will be accomplished by electrifying sectors that are currently fossil fueled. Mainly these sectors are road transportation and space/water heating. Electrifying these sectors will demand many tens of thousands of megawatts of non-emitting generation capacity. This must be *new* capacity. Large nuclear reactors must be front and centre in the discussion.

On Wednesday July 5, large reactors finally entered the discussion, with Ontario Energy Minister Todd Smith's announcement at the Bruce site that planning has begun to add 4,800 MW of new capacity to the site. Bruce C may well actually see the light of day. This was good news.

Pickering: still a clutch performer, after 50 years and counting On July 4, Pickering unit 8 began ramping up, joining its 5 sister units at full power by July 7. All Ontario air conditioners were running full blast to deal with the heat, and PNGS's power was urgently needed.

This represented the first time in the last 90 days that all station units produced at full power. Most of the time, PNGS produces between 2,000 and 2,600 MW. This is because of policy, not any technical deficiencies of the units. If wind is producing above 30 percent of its capacity, typically at least 2 PNGS units do not produce. That is, unless power is needed, at which point policy acknowledges that wind cannot be relied upon and the system operator reluctantly calls on generators that *can* be relied upon. We feel this is no way to run a railroad, or a grid.

OPG in late June asked the CNSC for permission to extend Pickering operation for a year beyond the current shut-down date of December 31 2024. The government of Ontario seconded OPG's request. We were very happy to see these moves; we had asked for exactly that in our submission to the government regarding IESO's "Pathways to Decarbonization" consultation in May. Keeping Pickering in service for another year gives the IESO the opportunity to avoid adding a further 10 million tons of CO₂ to the atmosphere—if it would just run all Pickering units instead of prioritizing wind, which needs gas backup.

Meanwhile, the wind Feed-In Tariff contracts which were signed after 2009 will expire beginning in 2029. Should Ontario renew them?

SMR progress CNWC are happy to see the ARC, eVinci, and BWRX-300 efforts progressing. NB Power submitted applications for environmental assessment and site preparation to the CNSC in the case of ARC, Westinghouse asked CNSC to review the eVinci design, and OPG announced it will add 3 BWRX-300s to the one already underway at Darlington.

But elephants are still in the room Still, Ontario has opted to commit large resources to a nuclear technology that contains all the features that we invented the CANDU reactor to get around.

Moreover, Canada's active nuclear workforce, 76,000 strong, is centred on CANDU technology. Our hands-on nuclear experts, the people who take the machines apart and rebuild them from the inside out, are CANDU experts. Ontario's new large reactors should be CANDU. Unfortunately, this critical subject is still not in the discussion. We urge our employers, and electricity planning authorities, to broaden the planning process to include it.

Focus focus While we were delighted with Minister Smith's announcements in early July, the only actual nuclear "game" in Canada is the Darlington and Bruce refurbishments, and the only new build is the 300 MW LWR at Darlington. In 2009, OPG opened bidding between three competing nuclear reactor designs: the CANDU ACR-1000, the American AP-1000, and the French EPR. It was felt it was only fair that the domestically designed ACR should not be sole sourced. In 2021, OPG selected an American design, the BWRX-300. Its major components will be manufactured outside of Canada, and the fuel will be sourced outside of Canada. OPG has never built such a machine. The reactor vendor, GE Hitachi, has never manufactured one. The regulator, the CNSC, has never licensed one. Was the CANDU even considered, especially since it represents the only power reactor design that OPG has ever operated, and that the CNSC has ever licensed? And why only build 1,200 MW at Darlington, which has an EA for 4,800 MW, the same amount now proposed for Bruce C?

Energy security: from electronvolts to megawatt hours Another dimension of energy security is experienced in modern medicine. The energy from radioisotopes like Molybdenum 99 and Cobalt 60 is essential in diagnostics, sterilization, and cancer treatment. The supply of Mo-99 is so vital that the Canadian Parliament was forced to intervene to resolve



a 2007 dispute between an isotope producer and the federal nuclear regulator so as to maintain the daily flow of this isotope to Canadian and world hospitals.

The 2007 crisis was resolved to the benefit of Canadians because it was resolved *in Canada*. If Canada were dependent on a foreign country for its vital isotope supply, then no act of the Canadian Parliament could have any effect on that country. Canada's CANDUS have always produced Co-60 and can now produce Mo-99 and other isotopes such as Lutetium-177. We need to maintain the supply of these vital materials.

By the numbers

IESO forecasts need a second

look Ontarians currently require roughly 1,000 megawatts of electric power generation per million population. Mostly overlooked is the fact that on average they also require roughly 1,200 MW of transportation power per million, which today is almost entirely provided by gasoline and diesel motors. (Electrified, those motors would require roughly 390 MW,

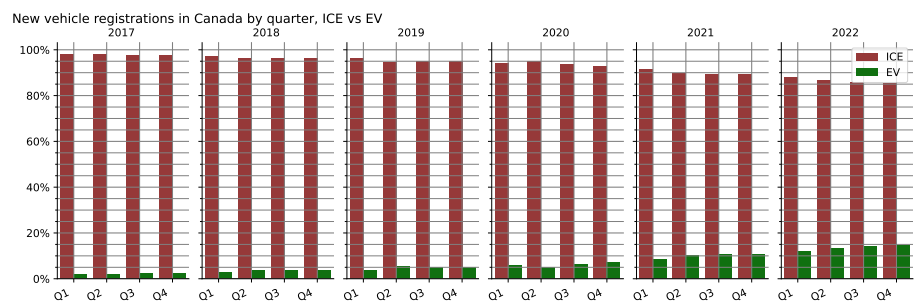
on average.) In winter, each million in population requires 2,100 MW of heating power, again, at current demand levels. "Shoulder" months—April, May, October, November—carry a requirement ranging from roughly 740 MW to 1,000 MW per million, and summer months roughly 300 MW.

An electrification tsunami on the horizon Electrification, then, would require the ability to provide from 1,600 MW to 3,500 MW per million population, depending on the season. With population growth under various modeled growth scenarios, this could, as early as 2030, translate into 1,800 MW at the low end and 4,080 MW at the high end. For every million in population, there's a 2,200 MW, i.e. a Lennox GS-size, difference between high season and low season power generation capacity requirements.

Heat is energy, so is electricity: a big new market for electricity generators and distributors Because the implications of space and DHW heating have in our view been imprecisely forecasted, markets, and revenue from serving those markets, have gone mostly unrecognized. Enbridge, Ontario's largest natural gas supplier by far, [earned an estimated \\$2.8 billion in 2021](#) from serving the space and DHW heating market in Ontario. (For comparison, Bruce Power can earn up to \$3.2 billion per year with all 8 reactors at full power at 90 percent capacity factor.) This market used an estimated 160 billion kWh of heat. Half of that amount is used in the period December through March.

Load characterization urgently required What are the characteristics of these loads? Currently, 15 million Ontarians (collectively) use on average 6,000 MW of gasoline power. This is raw power usage, and because usage is "decentralized" (millions of individual vehicles each with its own "power plant," a.k.a. engine) there are no constraints such as demand having to exactly equal supply at the right voltage and 60 Hz frequency. The electric power that replaces this gasoline power *will* have those constraints. And, from the figure above, EV penetration into the Canadian motor vehicle fleet is growing. See "[NERC issues warning to EV makers: talk to us before going further,](#)" below, for some unsettling consequences of this unprecedented growth. We hope IESO, OEB, the Ontario generation utilities, and local distribution companies are aware of this. The numbers of customers and connections in the residential and "General Service less than 50 kW" OEB rate classes was higher in 2021 than in 2015; these are the ones most likely to see Level 2 chargers. Will these categories have grown higher still in 2022? The OEB will publish the 2022 figures in November.

We are happy that IESO has conveyed to the government the urgent need to begin processes now to secure the capacity to meet the needs of Ontarians in the very near future. We urge all authorities involved in electricity planning to continue efforts to forecast the demands involved in our electrified future.





Our major employers

SNC reminds the world they're still in the large reactor biz: energy security again tops list of CANDU pros

Canada is CANDU country, exactly because carbon-free energy security is the bedrock *sine qua non* of any modern society anywhere in today's world. SNC Lavalin, which owns license rights to CANDU power reactors, ran through the list of benefits at a Toronto Board of Trade event on June 26. We're happy to see the company reminding its most important market that in spite of all the excitement about new reactor designs, CANDU remains the only viable off-the-shelf bulk zero emission power technology. Prospective buyers in Ontario really have only one credible option when it comes to meeting Ontario's, and Canada's, 2050 emissions targets.

Bruce and OPG accumulate CANDU refurb know-how Every hour of every day of the Bruce MCR and Darlington refurbishment, the project workforces acquire greater knowledge and familiarity with the guts of a CANDU. That's 87 continuous months, over 62,000 days. OPG reports 700–850 full time employees dedicated to the Darlington project—over 9 million person-hours of CANDU-specific major project experience with those 700–850 FTEs. See [OPG's Darlington Refurbishment Annual Report](#).

Bruce, no doubt using different metrics, [reports](#) 3,500 trades employees on site dedicated to the MCR.

We should point out that both the Darlington and Bruce refurb have stayed on schedule and on or under budget, in some extremely testing circumstances including a major Black Swan event (the Covid Pandemic) and inflation rates not seen since the 1980s. We are confident OPG and Bruce know CANDU refurbishment pretty much inside and out.

This invaluable experience could be directly applied to refurbishing Pickering, and indirectly to a new CANDU build. The refurbishment workforce, at Darlington and Bruce, is the closest thing Ontario has had to the unparalleled workforce that built the original CANDUs in Ontario, and the CANDU-6s in Quebec, New Brunswick, and the rest of the world. Those CANDUs are racking up very impressive performance numbers, which is no surprise to anyone who follows nuclear technology.

In light of this, we urge the Government of Ontario, the Independent Electricity System Operator, and our employers OPG and Bruce Power, to reconsider the implications of electrification in a carbon-constrained world. By simple math, Ontario's planned capacity additions seem inadequate to handle this coming major development.

Cameco remains atomically bullish, as Canada leans toward light water The US and Canada jointly agreed to firm up the international civilian nuclear fuel supply chain, particularly the supply of low-enriched uranium and high-assay low-enriched uranium. Why does this jump out? Because Canada is CANDU country, and the joint statement is not exactly a ringing endorsement of the technology that has powered Canada's biggest province for five decades without hiccup or carbon or air pollution. We mentioned OPG's and Bruce's nearly 20 million person-hours of intimate, hands-on CANDU-specific experience since 2016. Our national nuclear major project experience entirely focused on CANDU, yet all players appear more interested in technology no utility has ever built, no regulator has ever licensed, and no vendor has ever developed beyond a paper draft. Natural Resources Canada's [joint statement with the US DOE](#), while a welcome indication that our countries are serious about weaning the world off Russian nuclear fuel, raises many questions.

NB Power mulls OPG partnership as Pt Lepreau performance issues continue In Fall 2021 we reported on the persisting cumulative downtime issues at PLNGS. These relate to a variety of problems involving mostly the non-nuclear areas of the plant, and have forced NB Power to procure replacement power, both from its own thermal plants (most of which the utility will have to shut down by 2030 so as to comply with the federal government order to phase out coal-fired generation), and from other utilities. As we noted in the Fall of 2021, the cost of unplanned outages is roughly \$50,000 per hour, or \$1.2 million per day in both electricity and generation fuel purchases.

These problems unfortunately have not gone away. Now NB Power has reached out to Ontario Power Generation, which has literally hundreds of millions of person-hours of experience running a power plant portfolio that is like a scaled up version of NB Power's, including multiple CANDU units, to explore the viability of a partnership aimed at fixing the issues at Lepreau.

Such a partnership could achieve an effective and mutually advantageous transfer of OPG's hundred million person-hours of CANDU-specific operational experience to New Brunswick, and bring that experience to bear on the operational issues at Lepreau. We hope it can, and don't see any reason it couldn't be.



The downtime at Lepreau has dropped plant capacity factor to under 50 percent. While this is unacceptably low for a nuclear facility, it would be the cause of great celebration among wind and solar proponents, whose technologies are saddled with inherently low CFs—roughly 30 percent on average for wind, and at most 15 percent for solar. Suggesting, as some nuclear opponents do, that Lepreau should be replaced with generation sources with CFs that are 50 percent lower than Lepreau's current one today would be absurd. New Brunswickers would pay even more for wind and solar “downtime” than they pay today for Lepreau.

And the downtime issues at Lepreau can, and will, be fixed. You can't improve wind and solar capacity factors.

In short...

Toronto Hydro to collect EV charging data In “[IESO forecasts need a second look](#),” above, we give 390 MW as the *average* power demand for fully electrified gasoline-powered light vehicle transport in Ontario, the operative word being *average*. That's a guess, in lieu of actual knowledge of how customers will charge their cars.

In reality, charging behaviour will likely be much different. What will it look like?


Toronto Hydro, in collaboration with the City of Toronto, NRCAN, and other organizations, has installed 47 individual street chargers at [25 locations](#) in the city, precisely to begin answering this question.

We hope Toronto Hydro will also consider the concerns of the North American Electricity Reliability Council, which recently raised the alarm about en-masse EV charging and its potential to significantly disrupt grid stability. See “[NERC issues warning to EV makers: talk to us before going further](#),” below, for some sobering details.

World leaders release open letter ahead of Paris finance summit In an attempt to refocus the world toward financial crises across the “Global South” arising from the Covid Pandemic, post-Pandemic food inflation, and the Russian invasion of Ukraine, leaders of Germany, France, the US, EU and others published an open letter calling for, among other things, a new consensus on debt relief. Mixed in with the list are references to the “just” and “green” transition. Poor countries hope to cover at least part of their debts with long-promised rich country aid to further this transition, but the letter suggests rich creditors wish to keep the issues separate. What's totally missing is what rich countries mean by “green.” We suspect it's the usual, renewable energy, batteries, and efficiency/conservation. We urge the governments of rich countries, including and especially Canada, to offer solutions that will actually provide millions of citizens of poor countries with the same levels of energy that we in Canada enjoy, affordably and with no carbon or pollution emissions. Read the Open Letter [here](#).

Nuclear plant hostages in Ukraine face threat of mines Russia's campaign to destroy Ukrainian electricity infrastructure did not stop with the arrival of western air defense to counter missile attacks on power plants. The destruction of the Kakhovka hydro dam in early June 2023 was the deadliest attack so far, and now there are [strong worries](#) that either the cooling pond or reactors at the Zaphorizhzhia nuclear plant were mined by Russian forces who are under increased military pressure from Ukraine and are desperate to create a diversion.

Ukrainian plant workers have run the facility literally at gunpoint ever since Russian forces occupied the area in 2022, and we can only imagine the stress and anxiety they are under. We utterly condemn Russia's criminal and barbaric conduct in and around ZNPP. This unprecedented and unacceptable situation must be resolved, and we call on the western governments who support Ukraine to make clear to Russia the consequences of sabotaging this facility.

CNWC  CCTN Newsletter is published four times a year by the Canadian Nuclear Workers' Council.
 Publisher: Bob Walker
 Editor: Steve Aplin
 bwalker@cnwc-cctn.ca
 Tel: 416-804-5542
 244 Eglinton Ave. East Toronto ON M4P 1K2

Canadian Nuclear Workers' Council
The collective voice of organized labour in the nuclear industries
 The Canadian Nuclear Workers Council (CNWC) is an umbrella organization of Unions representing workers in all sectors of the Canadian nuclear industry. Founded in 1993, it represents sectors including electric power utilities, uranium mining and processing, radioisotope production for medical and industrial purposes, nuclear research, construction and trades in Ontario and labour councils in host communities.

Members include Locals of: International Association of Firefighters ● Atomic Energy Allied Council ● Canadian Union of Public Employees ● International Brotherhood of Electrical Workers ● International Association of Machinists & Aerospace Workers ● International Federation of Professional and Technical Engineers ● Power Workers' Union ● Provincial Building and Construction Trades Council of Ontario ● Professional Institute of The Public Service of Canada ● Society of United Professionals ● Society of Professional Engineers and Associates ● United Steel Workers ● UNIFOR ● District Labour Councils (Grey/Bruce, Durham, Lindsay, Northumberland, and Saint John).



What others are saying

NERC issues warning to EV makers: talk to us before going further

“The transportation sector will increasingly depend on the safe, reliable, affordable, and secure delivery of electric energy to EVs. The dramatic increase in demand required to support the growth of EVs will challenge the electric power system in many ways. The rapid growth in demand from EV charging, which consists of loads that are connected to the grid through power conversion inverters, is unprecedented and is taking place at the same time electricity system operators and planners are also focused on integrating rapidly growing levels of inverter-based generation resources, extreme weather impacts, and increasingly malicious security threats.

“The [California Mobility Center Electric Vehicle Grid Reliability Working Group] expects these effects on the electric power system will only intensify as the penetration of EVs on the grid increases. These impacts must be managed in order to maximize the speed of adoption. Examples include, but are not limited to, the following:

- Demands on distribution providers to process EV charging load interconnection requests may increase faster than can be managed by these providers and lead to delays in new interconnections. [See “*IESO forecasts need a second look*,” on page 3.]
- Significant increase in distribution system hosting capacity and loading effects may cause operational problems in distribution systems requiring expensive, last-minute upgrades in order to accommodate EV charging demands.
- Large-scale changes to demand profiles due to unmanaged EV charging behavior, time-of-use rates, and distributed renewable energy resources (DER) may lead to resource adequacy shortfalls and create needs for short-term, emergency rationing, such as planned, rolling blackouts.
- Faster load growth than is anticipated by current demand forecasts may have unexpected negative consequences for capacity and energy resource plans.
- The need for flexible ramping resources and reserves carried by [bulk power system] balancing authorities (BA) and transmission operators (TOP) may grow faster than that which has been anticipated in current long-term planning and operational planning studies.

...

“EV and [electric vehicle supply equipment (EVSE) original equipment manufacturers (OEMs)] are strongly encouraged to collaborate with NERC and the national laboratories through the exchange of EV charger performance data as an input to modeling and validation initiatives that will take place in the coming years.

...

“Properly modeling the aggregate EV charger performance is critical for ensuring that system planning and operations studies accurately represent the grid and its interconnected elements. Grid planners and operations engineers rely on this information to establish infrastructure plans and set operating limits. Therefore, collaboration across sectors will be increasingly important as EV charging loads continue to grow and increase their impact on grid performance. NERC technical stakeholder groups will continue to evaluate and improve EV charger and EVSE modeling, and NERC will be evaluating ways to enhance collaboration across sectors in the future.”

Source: North American Electricity Reliability Council, “Electric Vehicle Dynamic Charging Performance Characteristics during Bulk Power System Disturbances,” https://www.nerc.com/comm/RSTC/Documents/Grid_Friendly_EV_Charging_Recommendations.pdf