



## Canadian Nuclear Workers' Council

## Conseil Canadien des Travailleurs du Nucléaire

Christmas 2023

### National Director's Message

It's been another outstanding year for Canada's nuclear industry but a few recent events warrant attention.

First, a pro-nuclear resolution was passed without opposition at the Ontario Federation of Labour Convention in November. The resolution calls on the OFL to work with Provincial Federations and the Canadian Labour Congress to lobby governments and ensure that any new investment in nuclear energy protects and expands high-quality unionized jobs. Specifically, OFL called for prioritizing the use of CANDU technologies for large projects, and mandating the development and protection of domestic Canadian supply chains for new small modular reactors technologies.

Second, in the fall 2023 economic update the Government of Canada announced it would be updating Canada's Green Bond Framework to include certain nuclear energy expenditures, specifically: investments in new reactors, refurbishment of existing facilities, research and development, and some investments in Canada's nuclear supply chain. This is the change we've been asking the Government of Canada for.

And last but not least, a declaration was made by 22 Countries at COP28 to triple nuclear power capacity by 2050. Then, for the first time in the history of the annual COP summits, the 198 signatory countries to the UN Framework Con-



*CNWC National Director Bob Walker*

vention on Climate Change officially called for accelerating the deployment of low-emission technologies, including nuclear energy, to help decarbonization.

The world's first Nuclear Energy Summit will be held in Brussels in March 2024 to build on this momentum.

These are all important milestones. In the communities neighbouring nuclear power plants, the support for nuclear energy has been very high. But for far too long, general perceptions about nuclear power have been based on anti-nuclear ideology and unfounded fear rather than facts. We cannot let this ideology dominate the debate. Our clean energy future requires fact-based decisions.

It's important to note that the impressive progress of the Ontario CANDU refurbishments is making the potential for nuclear new build possible. The skill and professionalism of today's Canadian nuclear workforce is enabling the many opportunities for tomorrow's projects. These include

The Darlington New Nuclear Project—Four BWRX-300 Reactors. Saskatchewan Power's plans to add nuclear to their energy mix. New Brunswick's plans for advanced SMRs—ARC and Moltex. Global First Power's micro-modular reactor at Chalk River. The eVinci micro-modular reactor at the Saskatchewan Research Council. 4,800 MW of new nuclear at Bruce Power. The new 1,000 MW CANDU Monark Reactor. Cameco's ownership stake in Westinghouse. The potential for nuclear energy in Alberta. Innovation in the development and use of medical isotopes. The opportunities in Canada's nuclear sector are boundless.

Reliable Energy. Clean Air. Modern Medicine. Great Opportunities.

Bob Walker



## Fed-Prov climate spat clarifies role of baseload electrical supply

**Alberta premier challenges federal carbon rule** In CNWC's most recent revision to the "Electrification Policy Position" series, we pointed out that Alberta faces a CO<sub>2</sub> emissions challenge that it won't solve with anything but massive amounts of new nuclear power. This fact is illustrated in the most recent spat between the Alberta premier and the federal climate minister.

Alberta premier Smith [told CBC's Power and Politics](#) that "Alberta needs more baseload power, and in this province that means natural gas." It is certainly true that Alberta needs baseload and that Smith is one of the very few politicians who acknowledges it, but unmentioned in any of the coverage was the fact that the oil sands sector is front and centre in current Alberta baseload supply. Any meaningful attempt to lower the province's GHGs must address this fact.

**Barakah to Alberta: yes you can** It is interesting that Premier Smith attended the COP28 summit in Abu Dhabi. UAE is a recent entrant to the civil nuclear club, by way of the most ambitious new construction program of the past 10 years, the 4200 MW (soon to be 5600 MW) Barakah plant on the Persian Gulf coast 275 km west of Abu Dhabi.

Before Barakah, UAE's power generation sector was, like Alberta's, almost entirely gas-fired, with a roughly 450 gram minimum grid CIPK. (Unlike Alberta, UAE has no interconnections with other grids, so all balancing is done by throttling generation.) The three operating units at Barakah have dropped UAE's CIPK to about 330 grams, and when its online unit 4's added weight will pull that down to around 300 grams. Alberta's current CIPK is where UAE's was prior to Barakah. With no plans for nuclear in Alberta, we're sorry but that's a hard floor.

In other words, one of the much-maligned oil rich Gulf states is running circles around Alberta when it comes to emissions reductions. It will stay that way until Alberta does what UAE did, and introduces nuclear.

**Canada and Alberta: time to get serious** CNWC [already suggested](#) what Alberta should do. The province should transition current liquid energy to electrical energy. That means increasing Alberta's electrical output, which means replacing the current fleet of gas-fired "cogeneration" plants with nuclear reactors. Those are the baseload plants Premier Smith wants more of. It also means increasing the capacity of the interties with BC, Montana, and Saskatchewan, because neighboring grids can become major electricity export markets for Alberta, provided the province moves decisively to be their predominant supplier. And—for the medium term—Alberta must develop LNG for export. The latter requires a deal with BC.

Finally, Alberta needs to abandon carbon capture and sequestration, or CCS. It is simply unrealistic to expect Canadians to believe emissions from Alberta oil sands and power generation, which together amount to over 110 million tons per year, will be captured and stored underground on their tax dime.

None of our prescriptions will be followed, of course. The feds and Alberta in late November agreed to fund CCS. [A collection of highly profitable private-sector oilsands operators](#) say massive public financial support is a *sine qua non* for CCS to go ahead. That fact on its own tells us all we need to know about the inadvisability of this approach.

We understand that the impetus behind this charade is fear of a constitutional crisis that breaks up the Canadian federation. That's a totally legitimate fear. But will public money wasted on CCS really avert such a crisis and save Canada? Perhaps. But it is a very short term, and very expensive, stopgap at best. And how long can governments expect to string the public along with these pie-in-the-sky science projects?

We urge Premier Smith to seriously consider nuclear.

**Nuclear finally admitted to federal Green Bond club, praises sung at COP and OFL** We are happy to see the federal climate change minister revisit his disqualification of nuclear for eligibility for the Canada green bond. Well done, minister, and thank you. Also we are delighted with the Ontario Federation of Labour's pro-CANDU, pro-nuclear resolution in late November. And we are very pleased to hear all the pro-nuclear statements from COP28 in Dubai. Thanks to the 3 1400 MW APR reactors of the Barakah nuclear plant connected to the UAE grid, the COP conference is being powered with 330-gram CIPK electricity. Prior to Barakah, UAE's grid CIPK was about 450 grams.

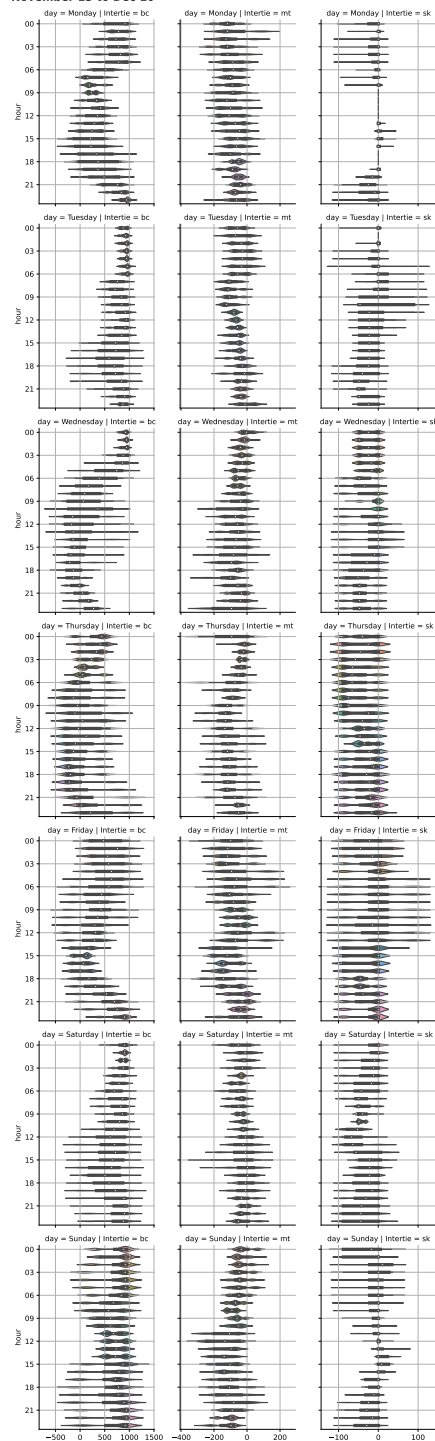
## By the numbers

**So 2022: Big Finance copies Big Oil's omni-directional ESG strategy** In the Fall 2022 edition of the *CNWC Newsletter* we pointed out that wind power from the Hand Hills wind farm in southern Alberta could not provide industrial pro-



cess heat for Shell Canada's Muskeg River "cogeneration" power plant near Fort MacMurray. Shell had agreed to buy the output from Hand Hills.

Alberta electrical intertie minutely flow distributions, MW  
November 13 to Dec 10



We also pointed out that Suncor, another oilsands operator, had also invested in wind power, and that so had all the Big Five Ontario automakers.

None of these entities actually use wind power in their daily operations. We explained why that is: wind output doesn't match electrical demand, either at the individual industrial operation or grid scale. That's been a "By the numbers" running theme.

Well, oilsands operators and automakers are not the only investors in wind turbines. Banks are involved too, including Royal Bank of Canada, Canada's biggest financial institution. RBC in 2022 entered into a power purchase agreement (PPA) with the owner of a new Alberta wind farm, Rattlesnake Ridge near Medicine Hat.

**The Bad Singer: tonight at 8:00 p.m., 7:54 p.m., 8:31 p.m.** RBC will buy 30 million kWh per year from Rattlesnake Ridge, which will represent about 9 percent of its total. The bank claims this is a step toward its goal of having all its operations powered with renewable energy. But with wind rarely in sync with demand (see the figure next page), RBC simply cannot accomplish this.

The sad truth is that wind output is out of sync with electrical demand, which operates according to two 12-hour clocks, one a.m., the other p.m. Interestingly, music is also a "modulo 12" world, in which, like grid electricity, precision or near precision of frequency, in Hertz or cycles per second, is vital. There are 12 pitches, each with its own frequency, in an octave. A bad singer either doesn't get this or cannot get his/her voice to sync with the right note (named pitch), or in an octave congruent with that note, at the right time.

A choir with a bad singer among its members needs good strong singers to drown the bad one out. In the electrical world, that role, on a grid with connections to other grids, is played by interties. Alberta's interties, represented in the figure to the left, are the most important balancers on the provincial grid. Ironically, Berkshire Hathaway Energy owns the Montana intertie. BHE also owns Rattlesnake Ridge. Is that a coincidence?

**RBC (not) in the Key of E** "E" here is environment, the E in ESG. For energy to deserve the E label, it has to be in key. With its Rattlesnake Ridge PPA, RBC is essentially foisting another bad singer into Alberta's "choir," only the potential consequences of asynchronicity go beyond an unpleasant listening experience. On the grid they can be literally catastrophic.

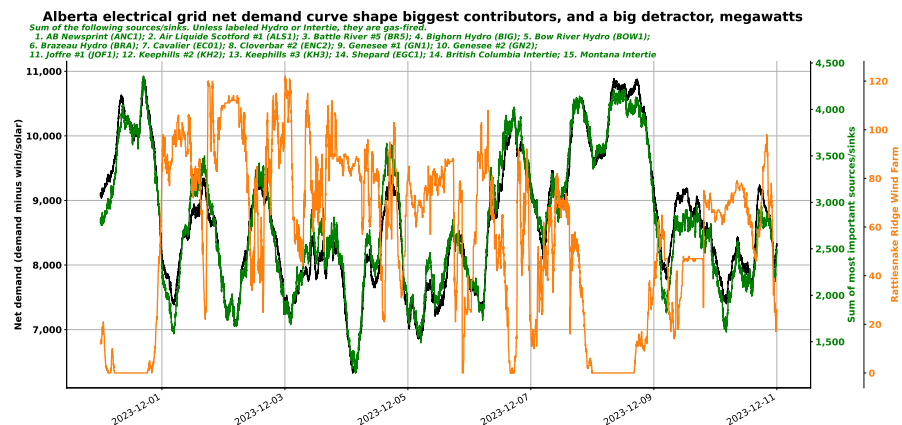
The Montana intertie is one of the most important balancers of supply with net demand in Alberta; so are the BC and Saskatchewan interties. As you can see in the figure, Alberta imported power across the Montana intertie most of the more than the 40,000 minutes represented. Interties perform the role that renewable energy proponents think that batteries will perform in the renewables-heavy grid they imagine will predominate in the future.

For renewables-and-batteries to look like Montana, or BC or Saskatchewan, intertie performance as shown in the figure, they would have had to *output*, in the case of Montana, 50–100 MW over those 528 hours—at least 26.4 million kWh in all. Batteries would have to at least match this kind

of performance, at all hours of the day, on all days of the year.



For an idea of how RBC's PPA counterparty Rattlesnake Ridge, one of Alberta's renewable energy "singers," performed over the same period of Nov 13 through Dec 10, have a look at the figure on the right. The green-labelled sources and sinks represent the "good singers" who sang from the same songbook (provincial net demand, the black curve). As you can see, *they* hit all the right notes at the right time, ensuring the daily 12-hour demand cycles were met.



## Our major employers

**Atkins unveils the Big Stuff: Flight of the Phoenix?** On November 28 AtkinsRéalis [introduced](#) the MONARK, a 1,000 MW CANDU designed specifically for the Ontario electricity market. CEO Ian Edwards said “modern large-scale reactors will play a critical role in producing the quantum of additional electricity supply that’s required to power the energy transition, providing energy security and reliable, clean power.”

We are delighted to finally see the world’s best nuclear technology marketed to the largest power generation customers in Canada. Ontario needs multiples of new thousand megawatt nuclear, just to protect our reputation as a clean electricity jurisdiction. We need many thousands more to decarbonize by electrification. CANDU is absolutely central to Ontario’s, and Canada’s, future. How much work has ATR done on “the big stuff”? Big Stuff is all the company’s ever done.

**Cameco, Brookfield finalize Westinghouse purchase, position to unseat Russia in East Europe LWR fuel market** Cameco is now officially proud owner of 49 percent of Westinghouse Electric Company, the iconic US nuclear vendor. Brookfield Asset Management owns the other 51 percent. [Cameco’s press release on the matter](#) describes the nature of the opportunities available to a minority equity partner in Westinghouse. Westinghouse designs, develops, engineers, and procures equipment for new reactors. It does *not* build them or take on construction risk. Currently the long-term revenue potential driving Cameco’s involvement appears to be proximity to opportunities for long-term fuel supply contracts. However, the company appears to believe venturing into construction may be possible, once engineering and procurement contracts are signed following a utility’s decision to build an AP1000.

We understand partnership is the name of the game in the reactor vendor world, and that a project management structure can be expected to evolve significantly following the initial decision to build. We just wonder why the bar is so much higher for our national reactor vendor. AtkinsRéalis is regarded more as an engineering services company than a reactor vendor. But doesn’t Atkins also have an in-house reactor design and development branch? And doesn’t Cameco itself describe Westinghouse as an engineering services company?

And—since we’re talking about partnerships between vendors and utilities—don’t large utilities have procurement branches in house, obviating the need for duplication of that function at the vendor?

**CNSC receives NB Power application to prepare site: ARC at Pt Lepreau** NB Power and ARC Clean Technology proceeded with the regulatory approval process for ARC’s novel sodium-cooled metal-fuel fast neutron reactor at Pt Lepreau. In June, they applied to the CNSC for site preparation, and an Environmental Assessment is in progress. This would be the first non-water cooled reactor in Canada’s history. There are as of this writing (early December 2023) no scheduled hearings or other CNSC proceedings related to this application.

The term “game changer” gets thrown around a lot, and we dislike using it inappropriately. But ARC really could change the game, in New Brunswick’s most important energy demand category, space heating.



**Bruce introduces nuclear carbon offset protocol** Bruce Power's Pat Dalzell, at COP28, [unveiled](#) a carbon offset protocol that is the natural progression of Bruce's earlier ground-breaking nuclear green bond and leverages the similarly ground-breaking work the company did in extracting more capacity out of its existing nuclear generators.

The new protocol awaits third party verification. While we hope BP passes this hurdle, we are skeptical. ESG, in spite of the massive Russia failure, remains mired in greenwash that elevates renewable energy and downplays nuclear. We salute the attempt, and wish Bruce well. Our fingers are crossed.

**OPG 2040 zero emission output challenge exponentially bigger** Last year we reported OPG's announcement to revisit both Pickering refurbishment and life extension. The two may sound like the same thing, but the latter is much more straightforward: it requires asking the regulator (CNSC) to consider the safety implications of extending the equivalent full power hour (EFPH) hold point for the reactors. The utility has said it won't go back to CNSC on this, having already asked for and received permission to push out the hold point, we don't see why a further request would be unreasonable. This would be by far the easiest way to keep clean bulk generation in the Ontario system in the near to medium term.

Long term is where refurbishment lives. While we hope OPG finds it worth while to refurb PNGS, we will accept whatever decision our employer takes. But we remind readers that if it's a no on refurbishment, then the importance of new large nuclear, preferably CANDU, is amplified. We hope our employers OPG and Bruce Power are on the same page.


## Video Watch

**"Atomic energy, climate, and Russia": DW finally warms up to nuclear** Why is Turkey so friendly with Vladimir Putin? Nobody seems to remember that Rosatom, the Russian civilian nuclear giant, is building 4,800 megawatts of light water reactor capacity ( $4 \times 1200$  MW) at Akkuyu, Turkey, a few minute's drive inland from Turkey's southern (Mediterranean) coast, just across the water from the Russian naval base in Syria. Construction began in 2018, was scheduled to be done in 2023, at which point the plant could be expected to produce about 12 percent of Turkey's electric power. [Rosatom's website](#) is muddy on the details of the plant's exact status as of today (early December 2023).

We won't comment on the advisability of Turkey, a NATO member, entering into a long term energy deal with Russia, the country NATO was created to defend against—just as we won't comment on NATO member Germany's decades-long natural gas purchase agreements with Russia.

Canada, along with the UK, US, and Australia, [in August 2023 announced](#) sanctions against Russia's "nuclear sector" as further punishment for Russia's criminal Ukraine invasion. How will these new sanctions square with Turkey's relationship with Rosatom and Putin, the prime targets of the new sanctions? A very interesting new documentary from the German state-owned international broadcaster DW looks at the tangled issues surrounding Akkuyu, climate change policy, and geopolitics. Uncharacteristically for DW, which has been an enthusiastic renewable energy and *energiewende* cheerleader, the documentary contains a brief segment in which a Siemens representative gently explains why renewable energy cannot run a power grid, and tacitly suggests why certain unspecified countries might want to revisit their strong positions on nuclear power. Siemens's explanation is exactly like ours in "[By the numbers](#)," on p. 2, above, only doesn't mention the critical importance of transmission interconnections with neighbouring grids. Watch the DW clip at [https://youtu.be/2Ws6qbf\\_hcA](https://youtu.be/2Ws6qbf_hcA)

**New SWU capacity urgently needed** In this excellent clip, our friend Mathijs (Thies) Beckers lays out the Russian takeover of the nuclear fuel market, and, with excellent explanations of the numbers underlying the market opportunities, suggests how western companies can take that market back. <https://www.youtube.com/watch?v=tk9HpJGPweY>

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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

### The astonishing daily music jam that is the electrical grid

The design frequency of all global power grids is either 50 Hz or 60 Hz. To maintain the frequency at this predetermined stable level, a **precise balance between production and consumption** across the system is required. The objective for “normal operation” is that the frequency should be kept within [plus or minus] 0.1 Hz from its nominal value. If the frequency deviates outside the range [plus or minus] 0.5 Hz from the nominal level, in most grids the system enters “emergency operation mode” and can suffer partial black-outs, both planned and unplanned. **If the deviation becomes even more serious it may cause a system failure and breakdown, with a complete loss of power supply.** Such a situation can take significant time to restore, with extreme consequences both economically and to human well-being.

“Maintaining control and controllability over grid frequency is therefore paramount in any power system.

**Control starts with generators.** Electric power production units can either be synchronously or asynchronously connected to the power system. Turbines and generators of synchronously coupled generation units rotate at the same speed within a system, which corresponds to the frequency of the system. Their rotational energy is, in effect, a kind of storage. It gives the system an “inertial buffer” against changes, which makes it resistant to disturbances that may affect frequency. If, for example, a large consumer, a production facility, or an interconnecting cable is lost, a momentary imbalance arises. Big interruptions like these can be on the order of 1 to 1.5 gigawatts (GW)—the size of some of the world’s largest nuclear or coal plants.

“Because electric supply must always equal consumption—that’s how grids operate, by connecting suppliers and users literally at the speed of light—the grid must respond to this loss. The lost supply is compensated for by the slowing down of the rotation of all synchronous units connected to the system (thus, the frequency is reduced), and the drained energy from this slowdown is released to the grid in the form of electrical production that compensates for the loss of supply. The greater the inertia of a system, the slower and smaller the frequency change for any given disturbance. **Inertia therefore creates time for the system’s active power regulation to respond and stabilize following disturbances.**

“A mental model describing system frequency and the role of inertia according to real physical principles can be presented via a “bathtub analogy...”. Here, power production corresponds to the addition of water into the tub from the tap at the top, while consumption is the flow out of the drain at the bottom. In this model, the water level represents the grid frequency, which remains stable as long as the flow in (production) and flow out (consumption) are equal. Any disturbance, meaning an increase or decrease in flow in either direction that causes the rates of the two to differ, will cause the water level (or frequency) to start changing. If there’s a blockage in the drain (i.e., falling consumption), the water level (and frequency) will start to rise. If the water pressure falls and the tap at the top starts supplying less water, the water level (and frequency) will start falling. The larger the tub, the slower and smaller the change in water level for a given imbalance. The volume of water in the tub is analogous to the inertia of the power system.”

*[emphasis added]* ...

Source: “Meeting the Challenge of Reliability on Today’s Electricity Grids: The Critical Role of Inertia” Oxford Institute for Energy Studies, September 2023 <https://www.oxfordenergy.org/wpcms/wp-content/uploads/2023/09/Insight-135-Meeting-the-Challenge-of-Reliability-on-Todays-Electricity-Grids.pdf>