Wind energy is reliable:

debunking claims that wind power failed New Brunswickers when they needed it most

CONSERVATION COUNCIL OF NEW BRUNSWICK

An extreme cold and windy weather event on the East Coast during the first week of February 2023 challenged NB Power to find enough power to meet record electricity demand. In this fact sheet, the Conservation Council tells the story of how that demand was met, shows the role wind power played in the Atlantic region, and challenges claims that wind power was offline just as New Brunswickers needed it.

On Feb. 4, 2023, our public utility faced record-high demand of 3,394 megawatt hours (MWh) at 10 a.m. as people tried to keep warm in freezing temperatures and high winds as seen in Table 1. On March 24, the Premier talked about the challenges NB Power faced that day, and made two points: 1) he noted that nuclear, coal and oil power-generating stations were running and generating electricity, but said that, ironically, it was too windy to generate electricity from our wind turbines, and 2) that Hydro-Québec stopped exports to N.B. on Feb. 4 because it too was facing peak demand and needed its power for its own citizens.

Atlantic Canada Wind Farms

42 Wind Farm Operators Contacted

80% Produced Electricity

The premier is right that Hydro-Québec halted exports during a critical time for New Brunswick, forcing NB Power to replace that supply with high-priced imports from New England (N.E.). The Conservation Council's research, however, shows that the Premier was incorrect in saying wind turbines could not produce energy during the high winds and frigid weather of Feb. 4.

We contacted wind energy producers in Atlantic Canada to learn whether the extreme weather in early February affected their operation. We learned that, of **42 wind farm operators** contacted in Atlantic Canada, **80 per cent were online** producing wind-powered electricity during the cold snap, **12 per cent** struggled with high wind speeds, and **8 per cent were offline** due to maintenance.

The turbines that were offline were mainly in New Brunswick—but for non-weather related reasons. Kent Hills, for example, had been offline since January 2022 for maintenance repairs due to cracked bases.

And even if all wind turbines in New Brunswick were operational during the cold snap, it wouldn't have prevented us from buying high-priced energy imports when Hydro-Québec turned its supply off to NB Power. **That's because New Brunswick's political and public utility leadership have for years delayed the investments we need to build more in-province renewables** to give New Brunswickers a robust, spread out, and resilient wind and solar energy supply.

Based on 2022 values, New Brunswick imports on average 817 MWh from Hydro-Québec per hour, while NB Power only generates on average 80 MWh of wind electricity per hour. Due to the severe lack of investment in renewable energy in N.B., our wind energy production is less than 10 per cent of what we import from Quebec.

It wasn't Hydro-Québec's fault we had to buy expensive energy to meet the crushing demand that day. It wasn't wind turbines' fault for being 'unreliable'—even those that weren't operational that day due to the high winds and cold temperatures.

It's a lack of leadership, both in the provincial government and at NB Power, that has created an energy security issue in New Brunswick. Wind turbines are reliable and a source of clean electricity—we just need to build more of them, across the province, to ensure reliability.

Think of it like a bundle of sticks. One stick by itself is easy to break, but a bundle of sticks is significantly more durable and unlikely to break.

A single wind farm highlights the intermittent nature of wind energy; when the wind does not blow or blows too hard, it will not generate electricity. But a distributed system of multiple wind farms solves this issue, as wind speeds are not consistent over a large area, meaning if the wind is not blowing in one location, it is likely blowing in another.

In N.B., specifically, the Lamèque wind farm struggled to produce any electricity on Feb. 4 due to vibrational issues caused by high wind speeds, but the turbine in Cap-Pelé had record-high production during that same cold snap. Our research shows that while some wind farms struggled during the cold snap, many were able to produce significant amounts of electricity.

The message is clear and is supported by the data: **the more wind farms, the more reliable**. Furthermore, our research shows that investing in regional transmission interties such as the Atlantic Loop would further increase N.B.'s energy security as we would gain access to all the wind farms in the Atlantic region.

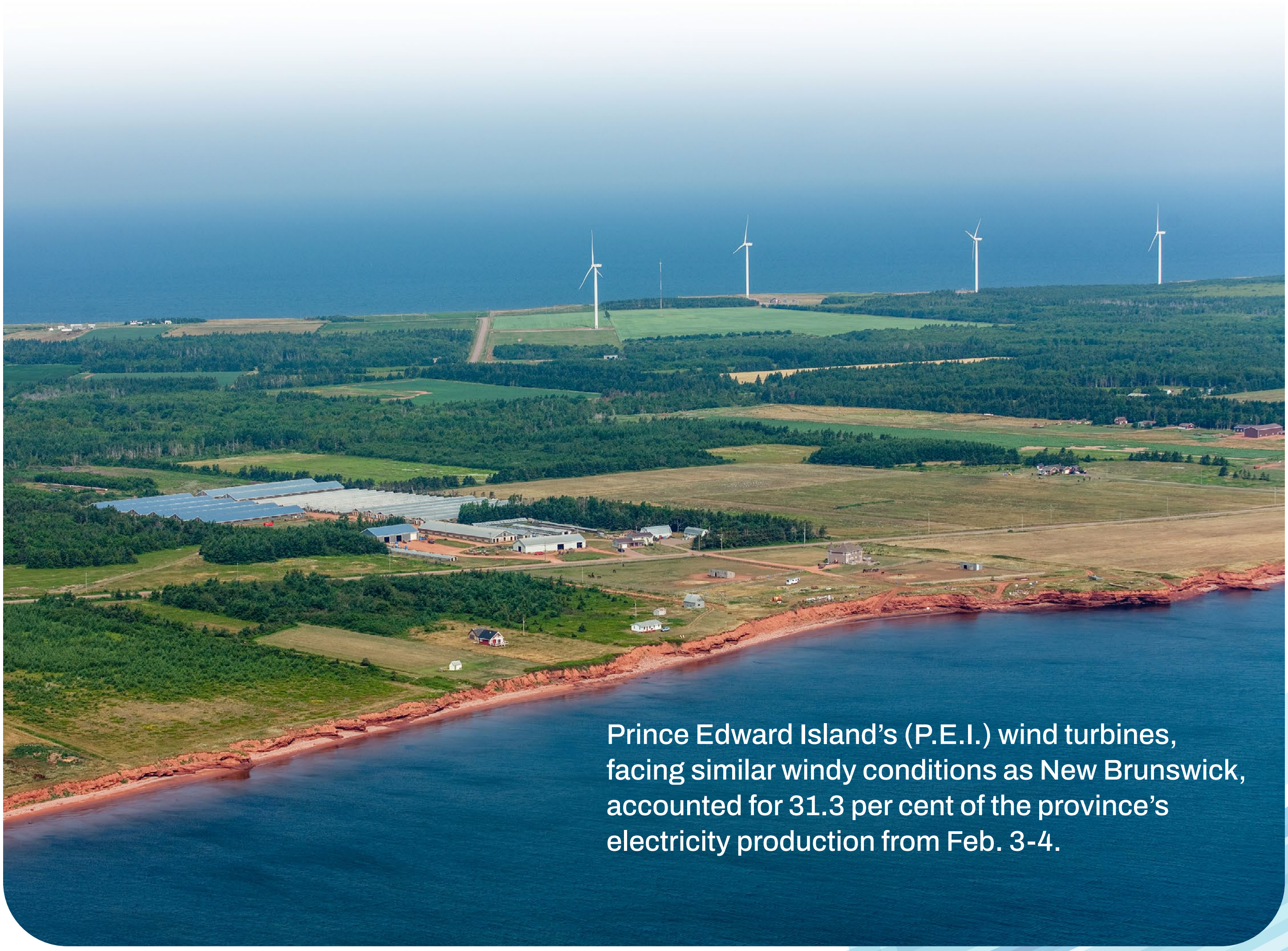
We find a similar story in Nova Scotia (N.S.). Scotian Wind, a prominent wind developer, noted that despite its three turbines on Cape Breton Island (Baddeck, Isle Madame, Saint Rose) underperforming due to high winds, its other 17 turbines exceeded production budget by 81 per cent between Feb. 3-4. **A distribution of wind turbines across the Atlantic is the best strategy for building a cleaner grid.**

Even though wind is an intermittent energy source, **it is abundant and infinite**. Investing in more turbines across the East Coast and connecting them with an Atlantic Loop would provide clean and renewable energy across the Atlantic.

Key takeaways:

1) Wind is reliable and 80 per cent of Atlantic wind farm operators contacted by the Conservation Council were online and producing electricity during the cold snap in early Feb. 2023. For example, Prince Edward Island's (P.E.I.) wind turbines, facing similar windy conditions as New Brunswick, accounted for 31.3 per cent of the province's electricity production from Feb. 3-4.

2) Investing in the Atlantic Loop to support two-way regional electricity trade in renewable energy increases energy security further by ensuring New Brunswick is not overly dependent on Hydro-Québec.



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A deeper dive: New Brunswick's peak demand during the cold snap in early February, 2023

We need to transition from a fossil-fuel dependent economy to a renewable-energy economy to address climate change. Electrification is one of the most important climate solution pathway, and the Conservation Council is a proponent of affordable and reliable renewable energy. One major source of renewable energy is using wind to generate electricity. Wind moves the blades of a turbine around a rotor, which spins a generator and creates electricity. Is this simple mechanism of wind power reliable?

Following the February 2023 cold snap—when temperatures fell to -36.8°C in Edmundston and wind speeds reached more than 60 kilometres per hour (km/h) in Saint John— some skeptics, including the Premier, claimed it was "too windy" to generate wind-powered electricity. Our research proves wind was reliable even during this extreme weather event as 80 per cent of the wind farms we contacted in Atlantic Canada were online and producing energy during the cold snap.

Table 1. The peak wind speed (km/h) and temperatures (°C) from Feb. 1-7, 2023

City		Feb. 1	Feb. 2	Feb. 3	Feb. 4	Feb. 5	Feb. 6	Feb. 7
Fredericton	Wind Speed	11	17	39	57	9	24	19
	Temperature	-25.8	-24.5	-27.6	-28.7	-24.0	-8.0	-11.7
Moncton	Wind Speed	16	28	55	62	34	40	36
	Temperature	-20.1	-19.4	-27.4	-28.3	-20.6	-8.1	-10.9
Saint John	Wind Speed	18	32	48	63	18	39	34
	Temperature	-20.3	-22.9	-28.1	-29.0	-19.3	-6.7	-9.9
Edmundston	Wind Speed	9	10	26	30	11	13	16
	Temperature	-36.8	-32.6	-29.7	-30.3	-30.1	-23.7	-28.9

Figure 1. NB Power's energy demand from Feb. 1-7, 2023, where a record-high demand of 3,394 MWh occurred at 10 a.m. on Feb. 4.

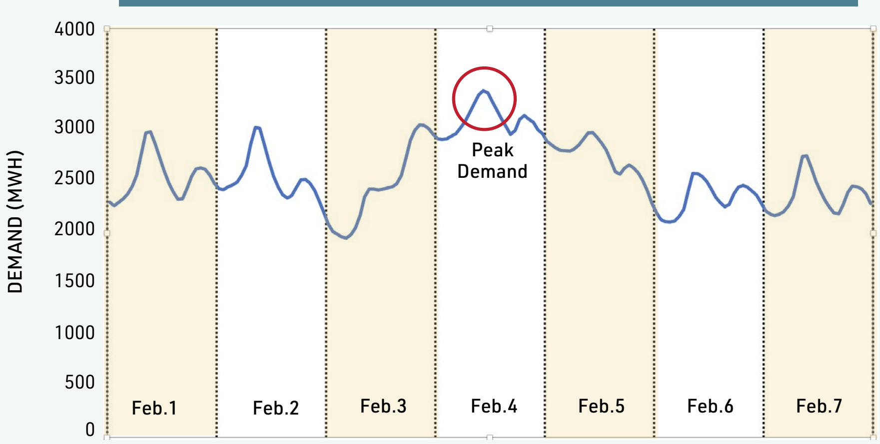


Figure 1 shows NB Power's energy demand from Feb. 1-7, 2023. Typically, we see a daily rise in energy demand around 6 a.m. as New Brunswickers wake up. The red circle on Feb. 4 at 10 a.m. is when our public utility experienced their record-high demand of 3,394 MWh. This is the period when the Premier and NB Power claimed the wind turbines in New Brunswick were offline.

After digging through NB Power electricity system operator data, the Conservation Council found it wasn't wind turbines that were unreliable, but Hydro-Québec. Figure 2 shows NB Power's imports from Hydro-Québec from Feb. 1-7. From this figure, we see that on Feb. 3, the day before the record-high demand, NB Power lost imports from Quebec twice. The first time from 1-5 a.m. and the second from 8 p.m. until 8 a.m. on Feb. 4. That is a total of 16 hours where we lost imports from Hydro-Québec. Quebec was dealing with the same cold snap and needed power to meet peak demand from their own customers, leaving NB Power to replace the Quebec supply with high-priced imports from New England.

The electricity power purchase agreement between NB Power and Hydro-Québec commits Hydro-Québec to exporting a total of 47 terrawatt hours (TWh, trillion watt hours) of electricity to New Brunswick between 2020 and 2040, with a minimum of 2 TWh supplied per year. There is no daily minimum requirement, meaning Hydro-Québec is under no obligation to supply NB Power during peak days, such as cold snaps and storms.

The red line in Figure 2 shows N.B.'s average wind electricity production during February 2022 as a comparison, making it clear that even if wind did produce at its maximum capacity, NB Power could not deal with the peak demand due to a combination of our over-reliance on Hydro-Québec and a severely underdeveloped New Brunswick-made wind energy network. The 80 MWh of wind power we can currently produce simply could not replace the 800 MWh lost from Hydro-Québec. We would need, and should build, a lot more New Brunswick-owned wind turbines to meet that level of demand.

Figure 2: NB Power imports from Hydro-Québec from Feb. 1-7, 2023

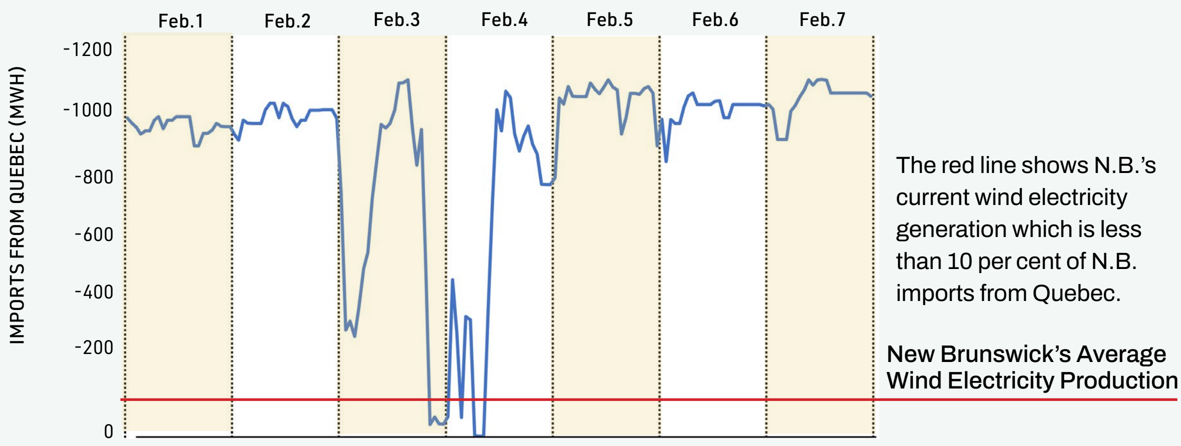
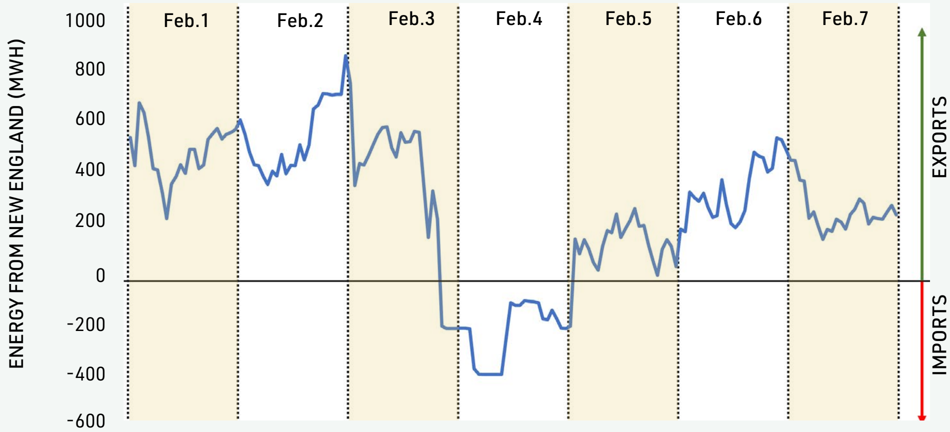


Figure 3: NB Power's exports and imports from New England from Feb. 1-7, 2023.



Negative values represent imports and positive values represent exports. When overlapping with Figure 2, it is clear NB Power imported electricity from N.E. when imports were lost from Hydro-Québec.

Since we could not get electricity from Quebec, NB Power needed to find another source of electricity. In this case, the utility imported from New England (N.E.). Figure 3 shows NB Power's imports and exports from N.E. from Feb 1-7. The positive values represent N.B. exporting electricity to N.E. and the negative values represent imports. Typically, N.B. exports to N.E., but from 8 p.m. Feb. 3 to midnight Feb. 5, NB Power imported a total of 6,208 MWh over 28 hours at a wholesale price.

Wind turbine performance across the Atlantic during the cold snap

Political and NB Power leaders claimed it was too windy to generate electricity from the province's wind turbines on Feb. 4. There are two issues with this statement: 1) N.E., P.E.I., and N.S. generated a significant amount of wind electricity during the exact same cold snap and wind conditions, and 2) a portion of N.B. wind turbines were offline due to technical and maintenance issues unrelated to the cold snap and windy conditions.

Table 2 shows wind farm operators we contacted across Atlantic Canada. During the cold snap, 80 per cent were operating and producing electricity. Table 2 debunks the myth that it was "too windy" to generate electricity in New Brunswick and our region.

Table 2: Wind farm performance on Feb. 4 in N.B., P.E.I., and N.S.

Province	Region	Total Nominal Power in megawatts (MW)	On/Off Feb. 4
New Brunswick	Cap-Pelé	2.35	On - record high production
	Kent Hills	167	Off throughout all of February due to cracked bases and maintenance
	Lamèque	45	On - but low production due to high winds
	Richibucto	3.8	Off - sensor issue and maintenance
	Wisokolamson	18	Four of the five turbines were down due to the cold, but all operational before and after
	Wocawson	20	Three of the five turbines were on during cold snap, other two had sensor issues and need maintenance
Prince Edward Island	Aeolus	3	On
	Eastern Kings	30	On
	Hermanville	30	On - low production
	North Cape	10.56	On
	Summerside	12	On - operated flawlessly
	West Cape	99	On
Nova Scotia	Amherst	37.5	On
	Aulds Mountain	4.7	On - local power outages from the grid
	Baddeck	1.7	Off due to high winds. On before and after cold snap
	Barrachois	s4.7	On**
	Black Pond	2	On
	Brenton	1.99	On
	Chebucto-Pockwock	10	On
	Dalhousie Mountain	51	On
	Digby Neck	30	On
	Fairmont	4.6	On

Table 2: Wind farm performance on Feb. 4 in N.B., P.E.I., and N.S. (continued)

Province	Region	Total Nominal Power in megawatts (MW)	On/Off Feb. 4
Nova Scotia	Gaetz Brook	37.5	On
	Gardiner Mines	4.7	On**
	Hardwood Lands	1.7	On
	Hillside Boularderie	4.7	On
	Isle Madame	2	Off due to high winds. On before and after cold snap
	Little River Harbour	1.99	On
	Martock Ridge	10	On - Two of the three turbines operational during the cold snap
	Millbrook	51	On
	Nine Mile River	30	On - shutdown due to high winds for 1.5 hours, operating during the rest of the cold snap
	North Beaver Bank	4.6	On and Off - several shutdowns due to high winds, sum of 8 hours offline between all 4 turbines, but operating throughout the cold snap
	Nuttby	50.6	On
	Parker Mountain	2	Off - 7 hours offline due to cold, operating the rest of the time
	Pictou Landing	1.6	On
	Point Tupper	22	On
	Pubnico Point	30.6	Off - Manually shut down on Feb 4th due to high winds, operating before and after the cold snap
	Sable	13.8	On
	Saint Rose	2	Off
	South Canoe	102	On Feb 4th, Off Feb 3rd
	Truro Heights	4	On
	Whynotts	4	On

The symbol ** refers to a wind farm that successfully produced wind power but that power was not used due to local power outages from the grid. (Note: this is not a complete list of all the wind farms in the region.)

So why did New Brunswick wind farms underperform during the cold snap and windy conditions when all of our neighbours produced wind-powered electricity? Upon investigation, most of N.B.'s wind turbines were already offline before Feb. 4. The Kent Hills wind farm, for example, is currently undergoing restoration due to cracked bases which is expected to be complete in mid-2023. Kent Hills was completely offline during February and could not generate any electricity.

The Indigenous-owned projects of Wocawson and Richibucto have six wind turbines with 23.8 megawatts (MW) of generation capacity that are rated for -40°C. Three turbines were offline due to sensor fault issues, and one was offline due to a blade replacement. The engineers investigating found the sensors required a reset and scheduled to replace them. The last two turbines were operating as normal and were able to generate electricity all throughout Feb. 4.

New England was able to generate 13,380 MWh of wind power on Feb. 4, approximately 560 MWh per hour, accounting for approximately 3.5 per cent of N.E.'s total generated electricity. On peak days, such as cold snaps or storms, N.E. burns fossil fuels to help with the peak demand, but on off-peak days, N.E. wind production typically accounts for 6.5-8 per cent of its daily electricity production. The region currently has 1,400 MW of installed wind capacity with another 15,818 MW of proposed on-shore and off-shore wind capacity to be added onto its grid. Our southern neighbours produced electricity from their wind turbines during the same cold snap and windy conditions New Brunswick experienced. The notion of "it was too windy to generate electricity from the wind turbines" is false. In fact, closer to home, P.E.I.'s wind turbines accounted for 31.3 per cent of electricity production from Feb. 3-4.

Addressing wind turbines' cold weather challenges

Cold weather presents additional challenges when operating wind turbines. Most turbines have temperature limits which are measured by internal sensors, and if it is too cold the turbine shuts itself down to prevent equipment failure. In freezing temperatures, ice can accumulate on the turbine blades leading to reduced power output. Wind turbine manufacturers, however, are building more advanced turbines to handle winter conditions. Turbines can come equipped and installed with 'cold weather packages' which provide heat to the turbine components such as the gearbox, motors, and battery. This allows the turbine to be operated in temperatures as low as -40°C, like the Wocawson and Richibucto projects. New technologies are now available such as rotor blade de-icing and anti-icing mechanisms which use heating and water-resistant coatings.

One way wind farm operators manage the supply of energy is by forecasting the expected wind production based on meteorological reports. Operators are aware if too little wind is expected to blow on a certain day in advance, and typically warn utilities to have other forms of energy available.

Wind turbines' environmental benefits and cost

Cold weather presents additional challenges. Wind power is an abundant source of renewable energy that does not suffer the same limitations as other energy sources like fossil fuels or nuclear. Fossil fuels require drilling for oil or mining for coal and produce an immense amount of greenhouse gas (GHG) emissions, primarily carbon dioxide, leading to the warming of our planet. Nuclear energy requires the mining of uranium and produces toxic and radioactive waste that lasts thousands of years. Both fossil fuels and nuclear require the use of a limited resource and produce planet-harming by-products. On the other hand, our wind supply is infinite and generates clean, renewable energy with no harmful by-products.

Wind power provides an opportunity to reduce a significant amount of greenhouse gas emissions by providing an outlet to transition away from fossil fuels. By the end of 2023, New Brunswick will have installed 397.4 MW of wind energy, however, our province has the wind-power potential of 41,536 MW if we exploit all possible locations based on a wind energy technical report. Thankfully, the cost of wind is consistently getting cheaper every year. Table 3 shows Lazard's recent levelized cost of energy report and it concluded wind is more competitive than gas and nuclear in their unsubsidized analysis. The levelized cost of energy (LCOE) calculates the total cost of building and operating an electricity generation asset over an assumed lifetime divided by the asset's energy production over that lifetime. This allows for the comparison of different technologies with unequal life spans, project size, different capital costs, risks, returns, and capacities.

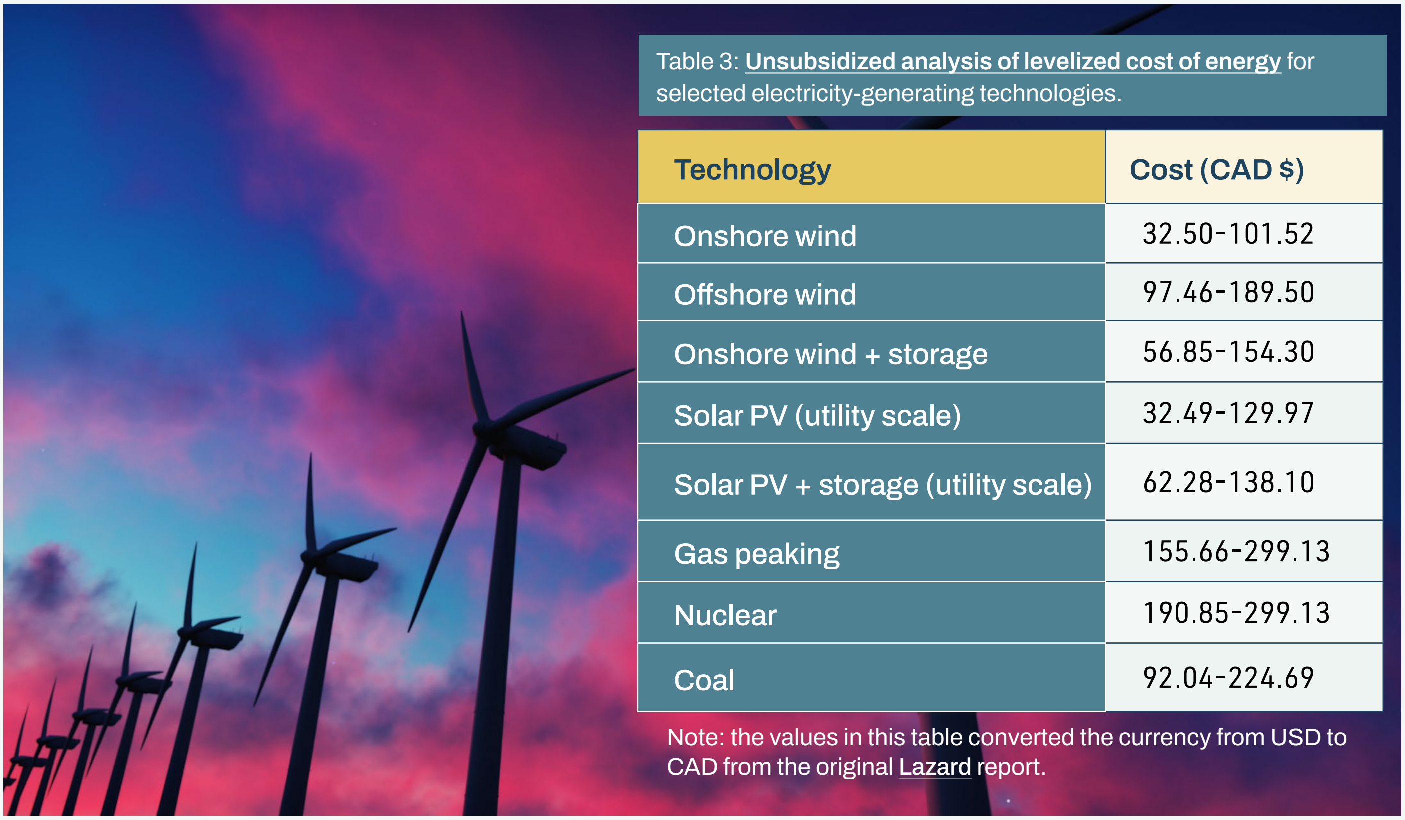


Table 3: **Unsubsidized analysis of levelized cost of energy** for selected electricity-generating technologies.

Technology	Cost (CAD $)
Onshore wind	32.50-101.52
Offshore wind	97.46-189.50
Onshore wind + storage	56.85-154.30
Solar PV (utility scale)	32.49-129.97
Solar PV + storage (utility scale)	62.28-138.10
Gas peaking	155.66-299.13
Nuclear	190.85-299.13
Coal	92.04-224.69

Note: the values in this table converted the currency from USD to CAD from the original Lazard report.

Conclusion

Investing in wind is the most practical, sustainable, and financially-responsible choice for New Brunswick to do its part to reduce the pollution causing climate change and provide reliable, affordable and sustainable electricity for citizens and businesses. The cost of wind energy has decreased by more than 70 per cent since 2009 making it more affordable than ever. New Brunswick needs to invest in a clean electricity strategy that incorporates more in-province renewables such as wind and solar, energy storage technologies and energy efficiency, while simultaneously developing the Atlantic Loop to import and export clean energy across the East Coast.

The cold snap and extreme wind in early February 2023 highlight the reliability of wind power, as evidenced by the wind turbine performance across the Atlantic. New Brunswick currently has an energy security problem as we struggle to meet peak demand and heavily rely on Hydro-Québec. These issues will only increase as Hydro-Québec struggles to meet its own in-province demand, especially with that utility's energy surplus projected to disappear by the end of 2026.

New Brunswick currently has too few turbines to generate the electricity needed to match current demand. Given the low cost of wind power, it is time for the provincial government and NB Power to show leadership and address this energy security issue by investing in more renewable energy. NB Power's February 2023 call for expressions of interest for 220 MW of renewable energy is a start, but much more needs to be done if NB Power is to replace fossil fuel generation in the province by 2035. Additionally, investing in the Atlantic Loop will further increase N.B.'s energy reliability by gaining access to clean renewables all over the Atlantic. A combination of wind power investment with the Atlantic Loop would allow New Brunswick to export and import clean energy while providing New Brunswickers with in-province electricity generation that is affordable, reliable, resilient and sustainable.

Established in 1969, the Conservation Council of New Brunswick is the province's leading public advocate for environmental protection. A member of the United Nations' Global 500 Roll of Honour, we work to find practical solutions to help families and citizens, educators, governments and businesses protect the air we breathe, the water we drink, the precious marine ecosystem and the land, including the forests, that support us.

Conservation Council of New Brunswick

180 St. John Street
Fredericton New Brunswick
Canada E3B 4A9

T. (506) 458-8747
E. info@conservationcouncil.ca
www.conservationcouncil.ca

/conservationcouncil /cc_nb

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