Towards a modern grid:
A Clean Electricity Strategy for New Brunswick

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For the Standing Committee on Climate Change and Environmental Stewardship

Conservation Council *of* New Brunswick
Conseil de conservation *du* Nouveau-Brunswick

The transition in New Brunswick

Following the coal phase-out, the federal government implemented the Clean Fuel Regulations and proposed the Clean Electricity Regulations.

From New Brunswick's Climate Action Plan 2022-2027

> "Develop a Clean Electricity Strategy by 2025 for achieving net-zero electricity emissions by 2035, based on guiding principles that support clean, reliable, efficient and affordable electricity."

Conservation Council's recommendations:

Part 1. Clean Electricity Strategy

- Invest in a portfolio approach to electricity with a high priority on renewable energy first, coupled with storage/battery options.
- Assess the viability of distributed energy resources (DERs) with smart grid technology.
- Increase the build-out of transmission infrastructure such as the Atlantic Loop.
- Commission an independent pathway assessment for net-zero scenarios in N.B.

Part 2. Affordability

- Address the backlog that NB Power has with the Enhanced Energy Savings Program.
- Expand the definition of energy poverty to include social factors.

Part 3. Policy Recommendations

- Update and modernize the *Electricity Act*.
- Add "sustainable net-zero mandate" to *Energy and Utilities Board Act*.

Part 1: Clean Electricity Strategy

Based off N.B.'s Section 68 (b) of the *Electricity Act*, renewables are the best path forward

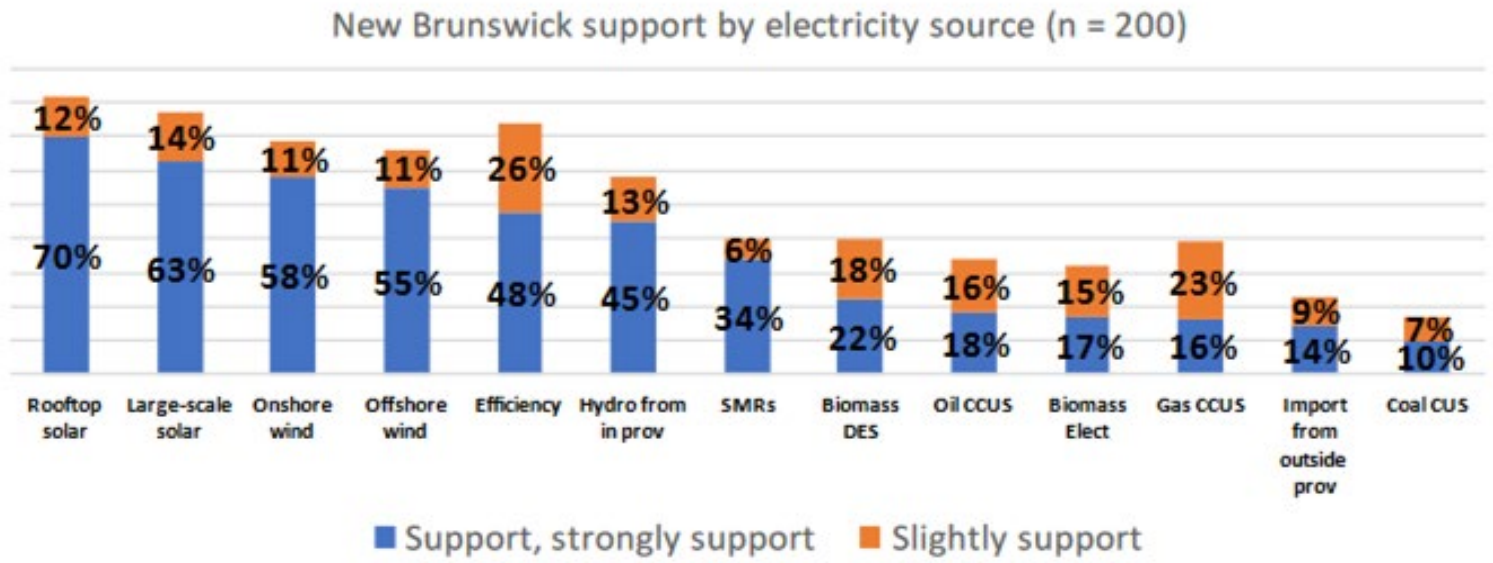
(b) be stable and predictable from that all the Corporation's sources and facilities for the supply, transmission and distribution of electricity within the Province should be managed and operated in a manner that is consistent with **reliable, safe and economically-sustainable** service and that will:

- (i) result in the most efficient supply, transmission and distribution of electricity,
- (ii) result in consumers in the Province having equitable access to a secure supply of electricity, and
- (iii) result in the lowest cost of service to consumers in the Province, and…

What energy sources should we focus on?

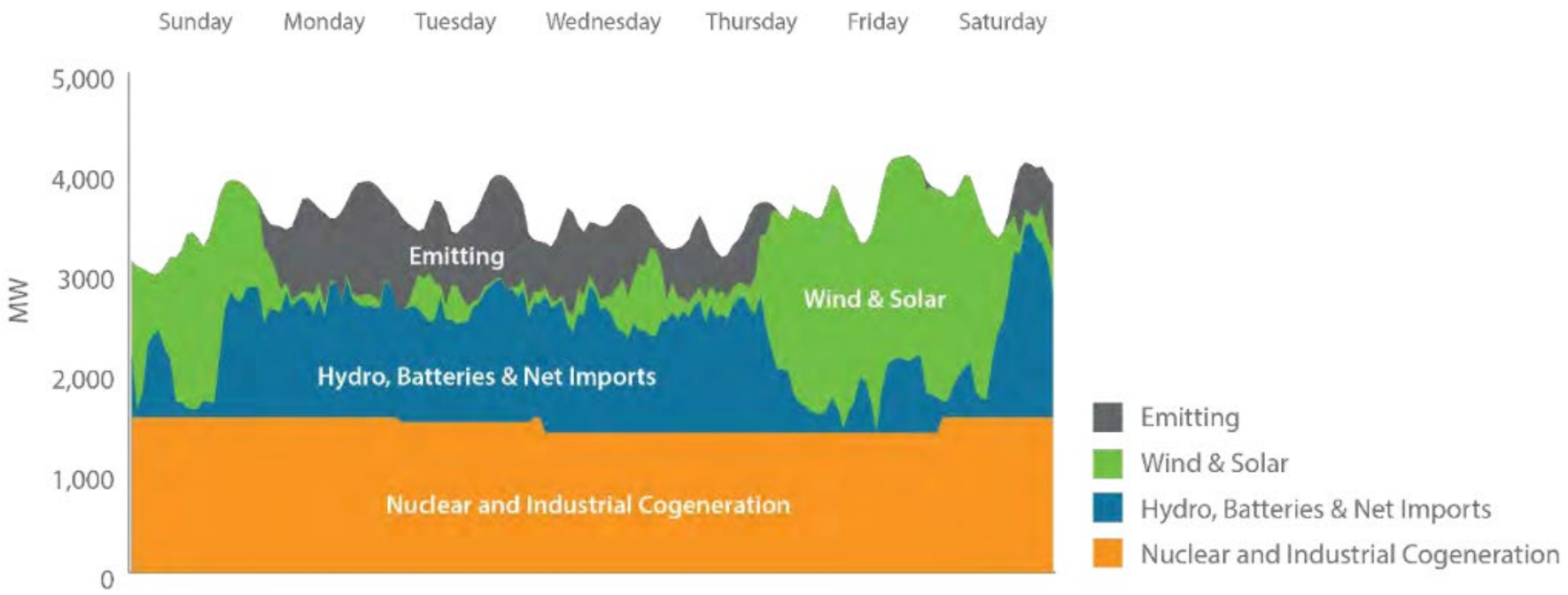
Let’s give New Brunswickers what they want.

Utilities need to make decisions over the next few years about how to supply electricity to customers. Please indicate how strongly you support or oppose the following electricity supply options in your community or region. You'll notice that there is not a sure option, but we encourage you to only use it if you don't have an opinion. **Results October 2022: Strongly support, support, slightly support.** (Conservation Council of New Brunswick’s national survey on clean electricity regulation).



Considering a portfolio approach

- From NB Power's IRP: The hourly energy balance for a week in January 2043 for scenario A (high electrification and rapid-paced technology development scenario)



Prioritize investment in abundant renewable resources

Conservation Council's recommendation

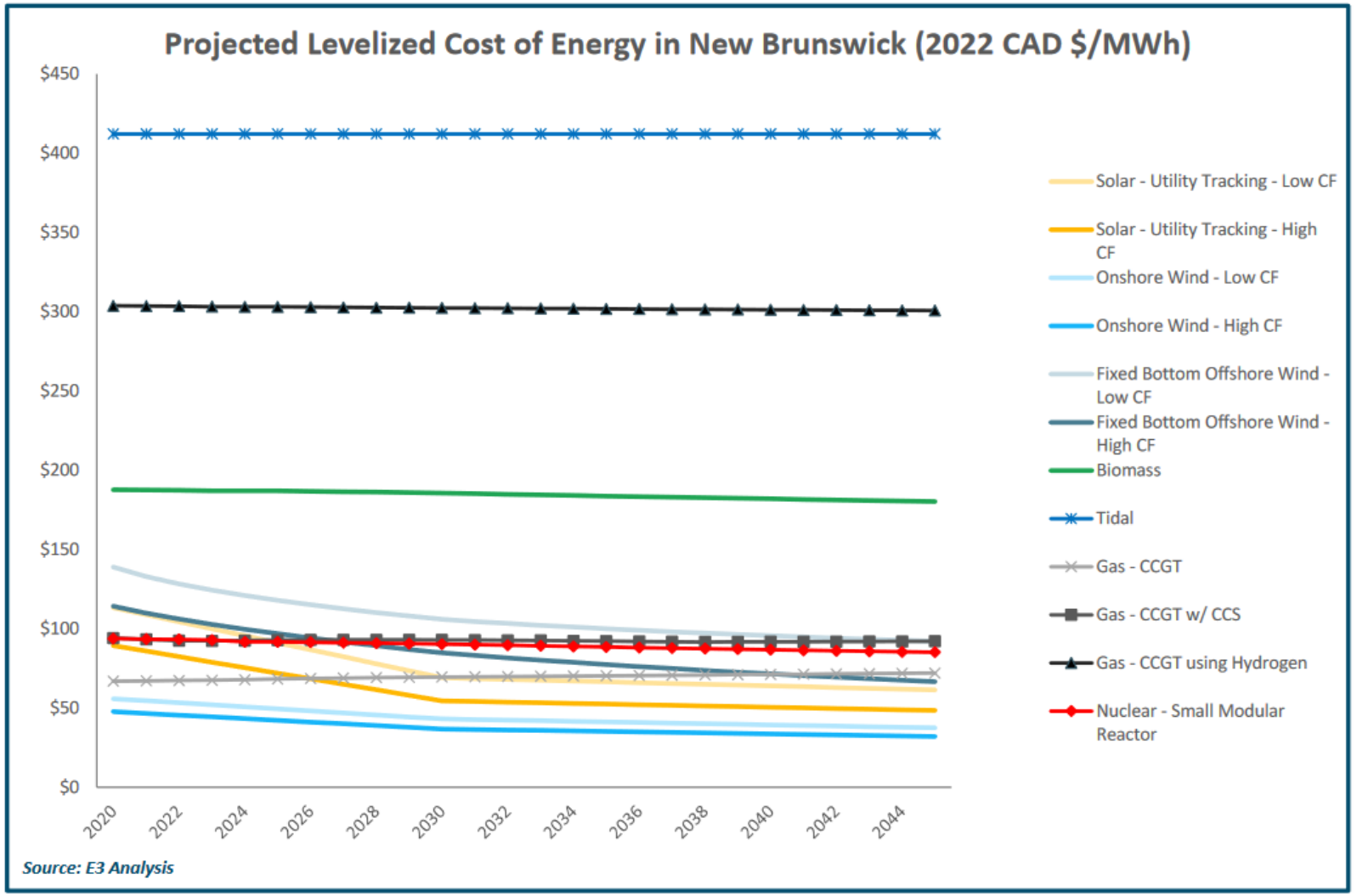
Year	Newly installed renewable generation (primarily wind) MW	Newly installed storage (primarily batteries)
2025	100	20
2026	200	40
2027	300 (NB Power's goal)	60
2028	400	80
2029	500	100
2030	600	120
2031	700	140
2032	800	160
2033	900	180
2034	1,000	200
2035	1,100	220

*With an additional goal of 30 megawatts of solar by 2035 – combination of residential and utility scale.

Levelized cost of energy

- E3 provided NB Power with data: NB Power Supply Options and Emerging Technologies Study

- Concluded "Onshore wind is the least-expensive energy resource today and will be for the foreseeable future"



Energy+Environmental Economics

Capital costs

Technology	Subtechnology	Capital Cost (2022 CAD $/kW)		
		2020	2035	% Change
Wind	Onshore	$ 1,996	$ 1,294	-54%
	Offshore	$ 3,977	$ 2,458	-62%
Solar PV*	Utility Tracking	$ 1,927	$ 1,038	-86%
	BTM Commercial	$ 2,809	$ 1,369	-105%
	BTM Residential	$ 4,299	$ 1,505	-186%
Biomass	Grate	$ 6,043	$ 5,595	-8%
Geothermal	Hydro/Flash	$ 8,679	$ 7,181	-21%
	Hydro/Binary	$ 11,073	$ 9,539	-16%
Tidal	N/A	$ 10,568	$ 10,568	0%
Wave	N/A	$ 13,777	$ 13,777	0%
Storage	Utility Scale Li-Ion (1 hr)	$ 547	$ 296	-85%
	Utility Scale Li-Ion (4 hr)	$ 1,701	$ 919	-85%
	C&I li-Ion (1 hr)	$ 1,225	$ 687	-78%
	C&I li-Ion (4 hr)	$ 3,281	$ 1,841	-78%
	BTM Residential Li-Ion (1 hr)	$ 1,730	$ 1,000	-73%
	BTM Residential Li-Ion (4 hr)	$ 4,459	$ 2,576	-73%
	Vanadium Flow (4 hr)	$ 3,258	$ 2,166	-50%
	Vanadium Flow (8 hr)	$ 4,616	$ 3,068	-50%
Natural Gas or Oil	Combustion Turbine - Frame - Dual Fuel (150 MW)	$ 1,402	$ 1,099	-28%
Natural Gas	Combustion Turbine - Frame (150 MW)	$ 1,124	$ 997	-13%
	Combustion Turbine - Aero (150 MW)	$ 2,607	$ 2,314	-13%
	Combustion Turbine - Aero, converted to run on Hydrogen (150 MW)	$ 2,738	$ 2,431	-13%
	Combined Cycle (500 MW)	$ 1,894	$ 1,764	-7%
	Combined Cycle w/ Carbon Capture & Storage (500 MW)	$ 3,423	$ 2,683	-28%
	Combined Cycle converted to run on Hydrogen (500 MW)	$ 2,974	$ 2,769	-7%
Nuclear	Small Modular Reactor (300 MW)	$ 8,001	$ 7,208	-11%

*Solar PV costs reported in $/kW-ac, reflecting inverter loading ratios of 1.35 for utility scale systems, and 1.15 for BTM systems

Renewables are cheaper than you think, and they are getting cheaper.

Based off previous slide numbers:

Technology	Capital cost 2020 ($)	Capital cost 2035 ($)
SMR (**300** MW)	2,400,300,000	2,162,400,000

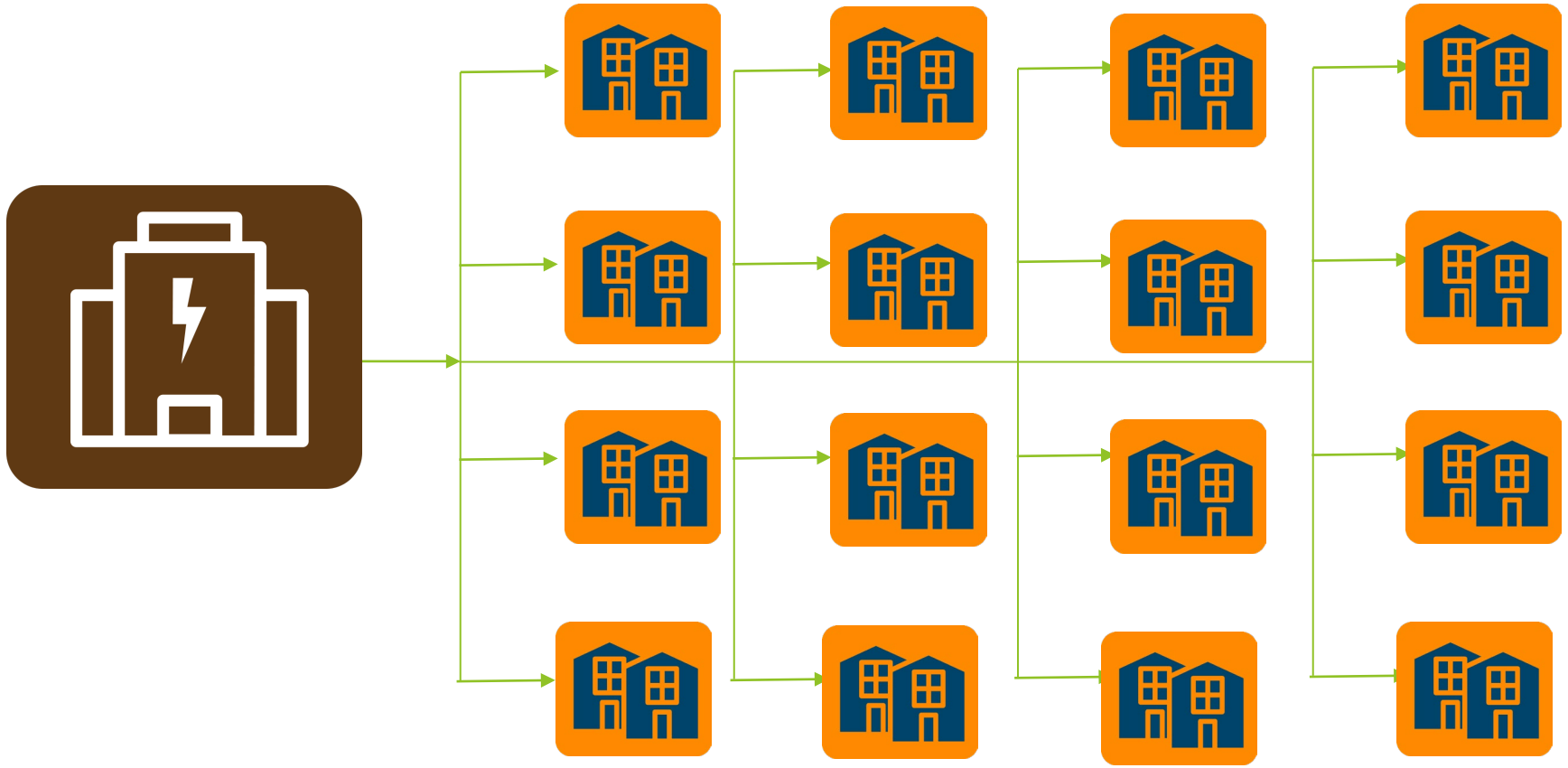
For the same price as a 300 MW SMR you could get any of these single options:

	Technology	MW (2020)	MW (2035)
Option 1	Wind (onshore)	1,202	1,671
Option 2	Solar (utility)	1,246	2,083
Option 3	Storage - Utility Scale Li-Ion (4 hr)	1,411	2,353
Option 4	Storage - Vanadium Flow (8 hr)	520	705

Part 1: Clean Electricity Strategy
Distributed Energy Resources (DERs)

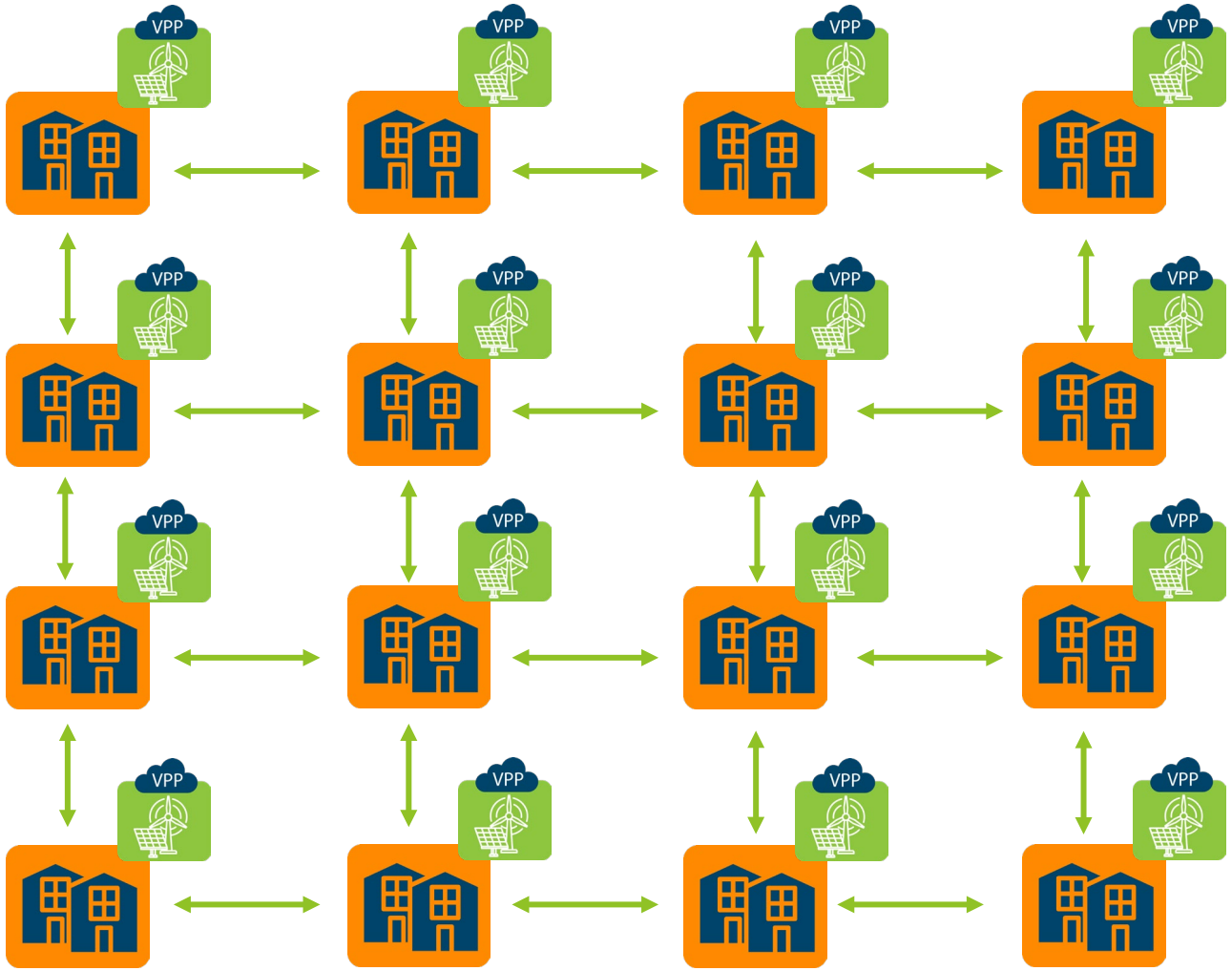
Current electricity system

What happens when something goes wrong?



Single direction transmission

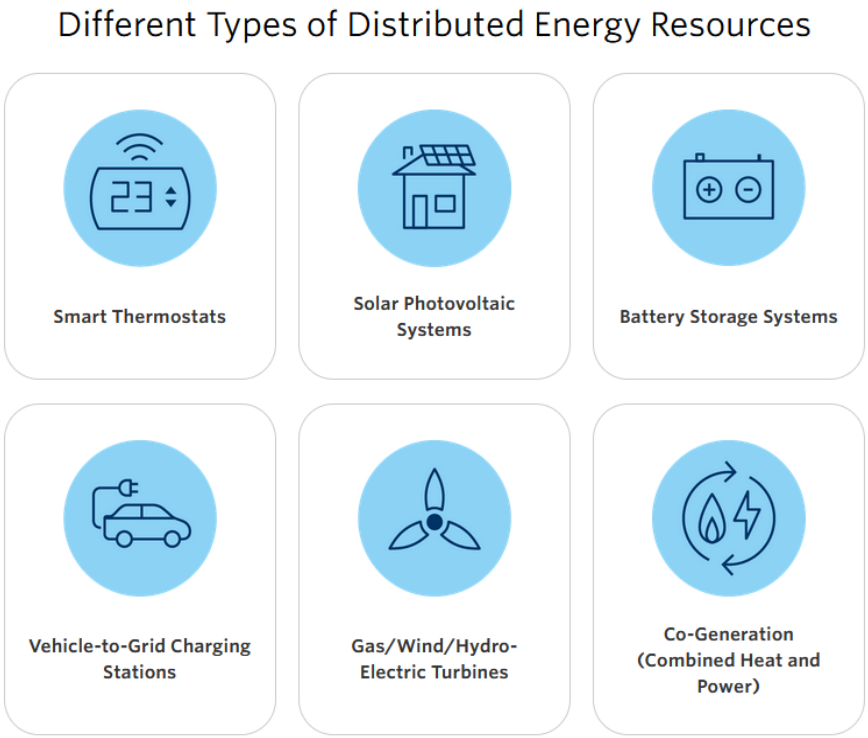
Modern electricity system



VPP

A virtual power plant (VPP) is an energy management system that integrates a variety of **distributed energy resources (DERs)** into a single, co-ordinated entity.
The primary purpose of a VPP is to optimize the generation, storage and consumption of electricity from these distributed resources to meet the needs of the grid, the electricity market or specific consumers.

Distributed energy resources are being considered in Ontario



Benefits of DERs:

- DERs naturally incorporate a lot of **smart grid** technologies.
- Provide customers with **transparency and control.**
- **Lower** system costs.
- Provide **energy security.**
- Chance to modernize **rate design** (time-of-day, tiered rates, demand response rates, low-income rate design, etc.).

Pilot phase of the **Shediac project** is currently ongoing (may be considered a DER).

Source: Independent Electricity System Operator (IESO) - Distributed Energy Resources

Part 1: Clean Electricity Strategy
Increase build-out of transmission infrastructure such as the Atlantic Loop

- The full benefits of the Atlantic Loop can only be leveraged if combined with in-province renewables.
- Build it while it's cheaper. Atlantic Canadian provincial governments should negotiate a better deal with the federal government and take advantage of Budget 2023
- Risk of N.B. being left out. New England – Maritimes Offshore Energy Corridor (NEMOEC) published a white paper proposing to build a two-gigawatt HVDC connector between Nova Scotia and Massachusetts.

Part 2: Affordability

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Address the backlog that NB Power has with the Enhanced Energy Savings Program

Energy Poverty level in New Brunswick	Total number of Households
High home energy cost burden 6 % +	114,800
Very high home energy cost burden 10 % +	47,775
Extreme home energy cost burden 15 % +	21,270
Low home energy cost burden <3 %	44,445
Median home energy cost expenditure	$2,776

Source: Canadian Urban Sustainability Practitioners

Part 2: Affordability
Address the backlog that NB Power has with the Enhanced Energy Savings Program

NB Power has received 22,000 registrations since Sept. 28, 2022, for the Enhanced Energy Savings Program (EESP) threshold of earning $70,000 or less.

Currently, there are 16,000 households on the waitlist for this program. The current rate of home retrofits under the EESP suggests it would take well beyond 2025 to reach all the homes on the waitlist.

Recommendations:

The provincial government or foundations should fund the development of a grassroots organization network to work with NB Power to get training and help with boots on the ground to implement energy efficiency programs and address the backlog of customers.

NB Power should publish case studies on customers who participated in the program. Include reporting on discrete efficiency metrics such as the amount of money and greenhouse gas emissions saved from switching to a heat pump and increasing energy efficiency in the home.

Part 2: Affordability
Expand the definition of energy poverty to include social factors

- Energy poverty is currently defined as households who spend 6 per cent of their after-tax income on energy bills.
  - The reality of the situation is far more complex.
  - Certain groups are far more vulnerable than others, such as renters, fixed-income families, rural households, single parents or a household of five with a family income of $80,000.
  - Researchers and academics are now taking an interest in energy poverty and recommend using a wide range of indicators.

Recommendation: NB Power and the provincial government should work with institutions like Efficiency Canada, relevant stakeholders and academics to develop a more thorough definition of energy poverty within New Brunswick that looks beyond just the financial aspect and considers social aspects.

Riva, M., Kingunza Makasi, S., O'Sullivan, K.C. *et al.* Energy poverty: an overlooked determinant of health and climate resilience in Canada. *Can J Public Health* **114**, 422–431 (2023). https://doi.org/10.17269/s41997-023-00741-0

Part 3. Policy Recommendations

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1. Raise the energy efficiency investment targets in the Electricity Act (per cent of in-province electricity sales) from 0.75 per cent by 2029 to 1.75 per cent by 2029, based on the 2020 Dunsky report for NB Power and Efficiency Canada's recommendations.

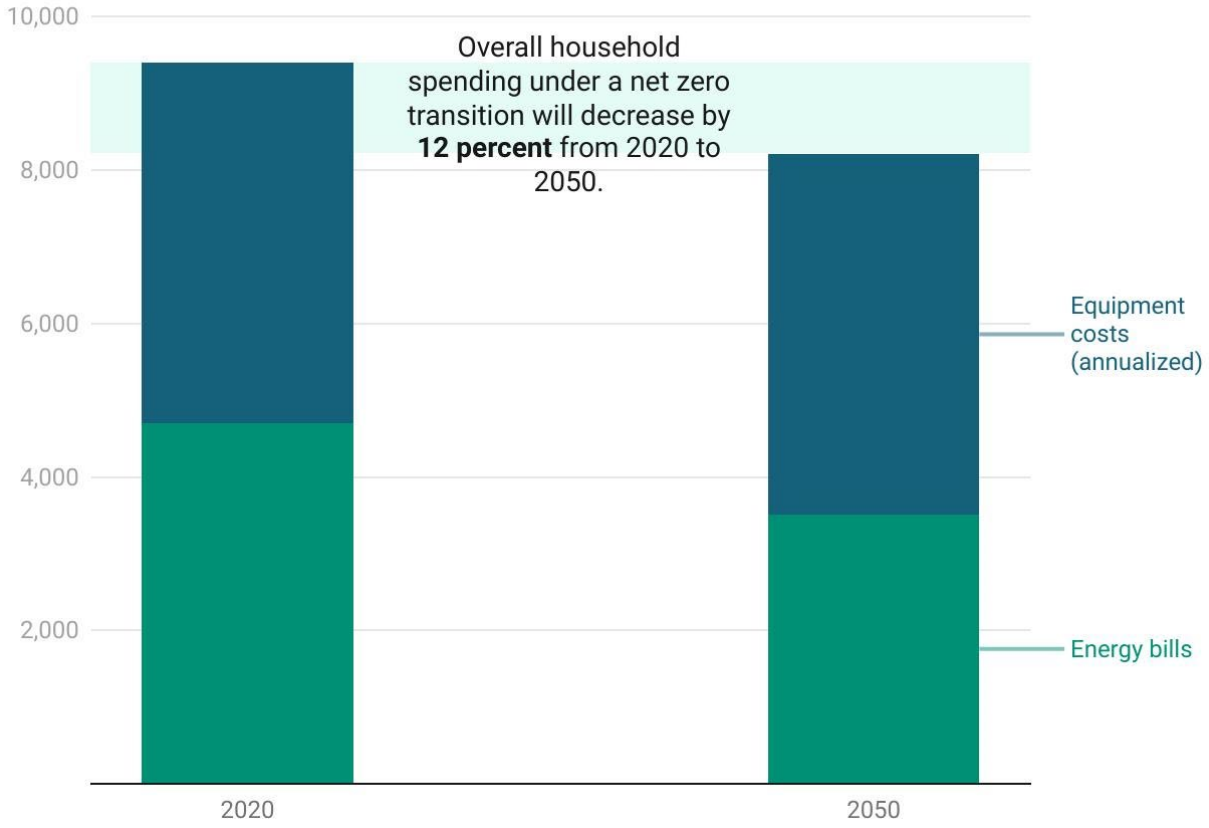
Year	Target Reduction	Recommendation
2023/2024	0.50 %	0.50 %
2024/2025	0.55 %	0.75 %
2025/2026	0.60 %	1.00 %
2026/2027	0.65 %	1.25 %
2027/2028	0.70 %	1.50 %
2028/2029 and thereafter	0.75 %	1.75 %

2. Raise NB Power's total in-province electricity sales from renewable resources from 40 per cent to 80-95 per cent by 2035 in the Electricity from Renewable Resources Regulation (NB Reg 2015-60), also under the *Electricity Act*.

3. Add an amendment to the Energy and Utilities Board Act to include a "sustainable net-zero mandate."

Conclusion

Household spending on energy under a net zero transition (2020 CAD).



Canadian Climate Institute

Transitioning to a net-zero grid will not only reduce bills but will help address energy poverty, health issues and mitigate climate change.

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Conservation Council Links

- E3 report on “NB Power Supply Options and Emerging Technologies Study”: https://www.conservationcouncil.ca/wp-content/uploads/2023/09/E3-report-for-NB-Power_Costs-1.pdf
- Shortcomings in Canadian Regulation of Wood Biomass Used to Generate Electricity: https://www.conservationcouncil.ca/wp-content/uploads/2023/09/ECEL_Report-on-the-Regulation-of-Biomass-Used-to-Generate-Electricity_Public-Distribution-Version_July-2023.pdf
- Biomass fact sheet: https://www.conservationcouncil.ca/wp-content/uploads/2022/05/Biomass-Fact-Sheet.pdf
- Hydrogen fact sheet: https://www.conservationcouncil.ca/wp-content/uploads/2023/07/Hydrogen-factsheet.pdf
- Storage fact sheet: https://www.conservationcouncil.ca/wp-content/uploads/2023/07/Factsheet-Electricity-storage-for-a-reliable-and-resilient-New-Brunswick.pdf
- Energy Poverty fact sheet: https://www.conservationcouncil.ca/wp-content/uploads/2023/03/Energy-Povertyin-Atlantic-Canada.pdf
- Wind energy reliability: https://www.conservationcouncil.ca/wp-content/uploads/2023/05/Wind-energy-is-reliable.pdf

External Links

- NEMOEC white paper: https://nemoec.com/publications/
- CCI Canadian households will save money in switch to electricity: https://climateinstitute.ca/new-analysis-finds-most-canadian-households-will-save-money-in-switch-to-electricity/
- IESO Distributed Energy Resources: https://www.ieso.ca/en/Learn/Ontario-Electricity-Grid/Distributed-Energy-Resources
- IEA Unlocking the Potential of Distributed Energy Resources: https://www.iea.org/reports/unlocking-the-potential-of-distributed-energy-resources
- NREL: Using Distributed Energy Resources- A How-To Guide for Federal Facility Managers: https://www.nrel.gov/docs/fy02osti/31570.pdf