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IMPLICATIONS FOR ATLANTIC CANADA'S ECONOMY IN THE PURSUIT OF NET-ZERO EMISSIONS

Economic Opportunities with Emerging Clean Energy Technologies

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Highlights

- > This report assesses potential economic opportunities in Atlantic Canada associated with the further development of three emerging clean energy technologies: hydrogen, small modular reactors and battery storage.
- > Hydrogen is expected to be a key energy source in the net-zero transition due to its versatility in export, transportation and industrial demand. If hydrogen production advances in our region, it could lead to billions of dollars of investment, hundreds of permanent jobs and faster integration of hydrogen into the local economy. The development of a hydrogen hub in the region would create efficiencies, improve the technology and reduce production costs.
- > Small modular reactors (SMRs) have several potential applications such as electricity generation and industrial heat production. Large economic benefits from SMRs would be realized if at least one of two proponents partnering with New Brunswick Power scales up and creates a SMR manufacturing industry in the province.
- > The adoption of large battery storage solutions can significantly benefit the electricity grid, supporting demand in peak periods and improving reliability. However, limited economic development benefits exist. Growth of battery storage for consumers and businesses could lead to revenue opportunities if they sell stored power back to utilities.
- > The timing and pace of adoption for emerging clean energy technologies is uncertain reflecting factors such as high investment costs and undeveloped supply chains. While these challenges impede deployment, the technologies are expected to become more economical as they mature.

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The Atlantic Economic Council is the source for independent research, providing the insights and ideas that are vital to supporting a healthy, inclusive and sustainable Atlantic Canadian economy.

Which emerging energy sources will drive economic growth in Atlantic Canada?

The Canadian government and all four Atlantic provinces committed to achieve net-zero emissions by 2050. They are implementing various climate actions to reduce emissions across the economy and within specific sectors.

The Atlantic Economic Council is conducting a research series analyzing the economic implications of the net-zero transition in our region. An earlier report in this series examined economic opportunities linked to three existing clean energy technologies: wind power, hydroelectricity and natural gas. Other existing clean energy technologies such as solar power and biomass can help us reduce emissions, but their economic potential in Atlantic Canada is more limited.

This report examines potential economic opportunities and challenges in Atlantic Canada associated with further development of three emerging clean energy technologies:

- > **hydrogen**
- > **small modular reactors**
- > **battery storage**

The timing and pace of adoption for emerging clean energy technologies is uncertain due many factors. These include high investment costs, the ability to raise financing and the size and timing of government support programs. Undeveloped supply chains and the capacity of electricity grids are also important. The cost of these technologies are expected to fall as projects scale up globally. As costs come down, they will likely play a larger role in powering our economy.



Hydrogen

Our assessment of opportunities in Atlantic Canada

Role in net-zero energy transition: **low in the short term / potentially high in the long term**

- > Several large-scale green hydrogen projects are proposed in Atlantic Canada. Five are currently being advanced in Newfoundland and Labrador, two in Nova Scotia and one in New Brunswick.
- > The EverWind Fuels project in Point Tupper, Nova Scotia and the World Energy GH₂ project in Stephenville, Newfoundland and Labrador are the most advanced in the region.
- > The proposed projects are largely focused on export opportunities, with the hydrogen shipped in the form of ammonia. The EverWind and World Energy projects will be connected to the provincial power grids and could supply power to utilities during peak demand periods and support energy security.
- > Energy firms in the region are examining future domestic uses including for transportation, industrial demand and heating for larger buildings. The use of hydrogen for these energy needs could have a large impact on reducing regional emissions.

Potential economic impact: **high**

- > Green hydrogen projects in our region are expected to be built in phases with each phase costing several billion dollars.
- > The two most advanced projects alone would lead to billions of dollars in investment, thousands of temporary construction jobs and hundreds of permanent jobs. They would generate significant export revenues. There would be supply chain opportunities and positive indirect impacts on the local and national economies. If other projects move ahead in the future these economic impacts would scale up.
- > Considerable investments would be needed in the future to expand hydrogen distribution in the region for use in transportation and heavy industry.

Role in the net-zero energy transition

Hydrogen is expected to be an important energy source during the net-zero transition due to its versatility. It could be used as fuel for larger vehicles and machinery that are hard to electrify, like tractor trailers and fishing vessels. Some manufacturing facilities may replace fossil fuels with hydrogen as a production feedstock. It could also serve as back-up power for intermittent renewables or during high demand periods. Hydrogen can also be blended with natural gas to lower emissions.

Currently, the global production of hydrogen mostly comes from natural gas, known as blue hydrogen. Green hydrogen, which is produced using renewable energy, such as wind, is [a focus for many countries](#). Atlantic Canada has some of the [best wind resources in the world](#) that could be used to produce green hydrogen. Deloitte estimates the global clean hydrogen market could be over US\$600 billion by 2030 with US\$175 billion being exported.

Green hydrogen is currently not produced in large quantities due to its high cost. Renewable energy is used to power electrolyzers that split water into hydrogen and oxygen. The cost of electrolyzers is one of the largest cost components, along with producing the renewable energy through large wind farms.

Greater energy diversification and government incentives are accelerating green hydrogen development. After Russia invaded Ukraine, the [European Union](#) set a goal to produce 10 million tons of domestic green hydrogen and import 10 million tons by 2030. The United States Inflation Reduction Act [includes subsidies](#) to significantly reduce the cost of producing low emissions hydrogen. The Government of Canada is introducing a [Clean Hydrogen Investment Tax Credit](#) for up to 40% of eligible expenses. Other countries are also implementing green hydrogen tax credits. [EverWind Fuels](#) and [World Energy GH₂](#) received loan guarantees from Export Development Canada to kickstart early-stage work on their projects.

The pace and ultimate scale of hydrogen production in Atlantic Canada are uncertain. Five green hydrogen projects are currently planned in Newfoundland and Labrador, two in Nova Scotia and one in New Brunswick. The most advanced projects are EverWind Fuels in Point Tupper, Nova Scotia, and World Energy GH₂ in Stephenville, Newfoundland and Labrador. They are largely focused on export opportunities but will be integrated with provincial power grids to provide support during peak demand and enhance energy security. The extent to which hydrogen helps Atlantic Canada transition to net-zero emissions depends on improving the technology so that costs are more competitive with other forms of renewable energy.

Nova Scotia released a [Green Hydrogen Action Plan](#) in December 2023 that outlines a framework and goals for hydrogen development. In January 2024, New Brunswick released its [Hydrogen Roadmap](#) which provides its strategy for hydrogen development and actions items to support development of the sector. Newfoundland and Labrador released its [Hydrogen Development Action Plan](#) in May 2024.

[Blending hydrogen with natural gas](#) reduces emissions from natural gas use. Up to 20% of natural gas could be replaced by hydrogen and transported using existing infrastructure. Liberty Utilities [signed an agreement](#) with Nu:ionic Technologies to produce and blend hydrogen into the New Brunswick natural gas system. Eastward Energy has proposed a \$30 million five-megawatt hydrogen electrolyser in Burnside to produce hydrogen. Irving Oil is [investing in a five megawatt electrolyzer](#) that will reduce emissions from its refinery.

Hydrogen hubs are key to creating efficiencies, improving technology and reducing the costs of producing hydrogen

A hydrogen hub is a network of producers, distributors, researchers and end users focused on accelerating hydrogen development. [Canada's Hydrogen Strategy](#) highlights the need for hydrogen hubs. The US government set aside \$7 billion for regional hydrogen hubs. Germany, Australia and the Netherlands are developing hydrogen hubs to accelerate the industry.

An Atlantic Canadian hub needs to be considered and should focus on green hydrogen. We have some of the best wind resources in the world to produce it. Other focus areas for the region could include developing export markets and powering ocean vessels.

It will be important for an Atlantic Canadian hub to partner with other Canadian hubs as they develop international hubs, building upon existing linkages. World Energy GH₂ is now a member of the Wilhelmshaven Germany Hydrogen hub. Newfoundland and Labrador signed a partnership with the Port of Rotterdam to cooperate on green hydrogen opportunities. The Port of Halifax signed an agreement with the Hamburg Port Authority to support the development of green hydrogen in their shipping corridor. The Port of Belledune signed an agreement with the Port of Rotterdam to work together on green energy solutions.

Several Atlantic ports could play a vital role in facilitating hydrogen shipments, such as Halifax and Saint John. Point Tupper, Belledune, Stephenville and Argentia are poised to expand as green hydrogen projects develop. Atlantic ports are the best positioned in North America to serve the European market, as well as certain Asian regions already on shipping lines. Several ports in the region are setting aside land for US offshore wind projects. This activity could grow if Atlantic Canada boosts offshore wind construction to power hydrogen. Adopting green hydrogen for ocean vessels could grow due to our strengths in international shipping, fishing, defence, offshore oil and boat building.

Partnerships are already underway to research hydrogen applications in our region. [Eastward Energy and Dalhousie](#) announced the establishment of a Hydrogen Applications Research Lab that will study the use of hydrogen blended with natural gas in appliances and other residential and industrial uses. [Canada's Ocean Supercluster](#) funding could support research for hydrogen projects related to offshore wind and marine uses. EverWind is partnering with Eastward Energy to explore green hydrogen opportunities and start scaling up the hydrogen supply chain in Nova Scotia.

Collaboration between project proponents, and other stakeholders is key to the development of local supply chains for the industry. It will also help lower costs of production so adopting hydrogen is more cost effective across industries. Developing talent at universities and community colleges will also be imperative for the industry to succeed. World Energy GH₂ is working with the DOB Academy in the Netherlands and the Qalipu First Nation to develop an institute that will provide high-quality green energy training.



Potential economic impacts in Atlantic Canada

European demand, federal government subsidies and early adoption by industrial users are incenting current activity in the green hydrogen sector. Proponents in the region have spent several hundred million dollars on the early stages of these projects. Billions could be spent over the next few years. The pace of green hydrogen development in Atlantic Canada may rise and fall over time depending on demand and cost competitiveness. Development could slow if project proponents are not able to reduce the costs of production closer to other clean power options. The demand for solar, wind power and other renewables is rising as their costs have fallen over time.

Proposed green hydrogen projects in Atlantic Canada

Proponent	Province	First exports	Capital cost	Hydrogen production	Ammonia exports	Renewable generation
			\$ billions	'000 tonnes per year	'000 tonnes per year	gigawatts
EverWind Point Tupper – phase 1	NS	2026	3.4	40	240	0.95
World Energy GH ₂ – Project Nujio'qonik – phase 1	NL	2027	6.0	70	400	1.0
EverWind Point Tupper – phase 2	NS	2027+	10.3	145	800	3.0
Pattern Energy – Argentia Renewables	NL	2027	2.1	30*	150	0.3
World Energy GH ₂ – Project Nujio'qonik – future phases	NL	2028	18.0	210	1,200	3.0
ABO Energy - Toqlukuti'k Project Phase 1 – refinery	NL		2.8	35		0.4
BAES Infrastructure – Bear Head phase 1a	NS	2028	3.5*	50*	250*	1.0
EverWind - Burin Peninsula	NL	2028	7.0	100*	500*	2.0
ABO Energy - Toqlukuti'k Project Phase 2	NL	2028-2034	20	400	2,000	5.0
Cross River– Belledune Green Energy Hub	NB	2029	1.5	20*	100*	0.2
Exploits Valley - EVREC	NL	2030	US 9.0	200	1,000	3.0
BAES Infrastructure - Bear Head phase 2	NS	2030+	3.5*	50*	250*	1.0

*Estimated by the Council based on global project average.

Note: Hydrogen in the first phase of ABO Energy project will go to the Come-by-Chance refinery.

Source: Project proponents, Atlantic Economic Council

EverWind’s investment in the first phase of its Point Tupper project is estimated to add \$1.3 billion to Nova Scotia’s Gross Domestic Product (GDP) and create over 5,000 full-time equivalent jobs. World Energy GH₂’s investment in the first phase of Project Nujiqonik could add \$2.5 billion to Newfoundland and Labrador’s GDP and require 5,400 workers per year over the three year construction of the project. These projects will also generate significant economic benefits such as employment income and government revenues during the operations phase. The economic impacts of Atlantic green hydrogen projects will also spillover to other parts of Canada as many suppliers of components are located outside our region.

Provincial economic impact* of phase 1 investment in green hydrogen projects

Proponent	Capital investment phase 1	GDP impact	Employment	Labour income	Government revenues
	\$ billion	\$ billion	Full-time equivalent	\$ million	\$ million
EverWind Fuels	3.4	1.3	5,200	670	311
World Energy GH ₂	6.0	2.5	19,300	1,800	798

*Direct, indirect and induced impact
Source: project proponents

Green hydrogen projects will lead to a wide range of employment opportunities. Trade workers required during the construction phase include welders, metal workers, pipefitters, millwrights, heavy equipment operators and labourers. Jobs will also be created in engineering, professional and business services. The development of wind and solar power infrastructure to support hydrogen projects will generate jobs in the renewable energy sector. The demand for hydrogen and fuel cell technicians will grow as hydrogen adoption increases. The construction of these projects will likely pull tradespeople away from the rest of the economy.

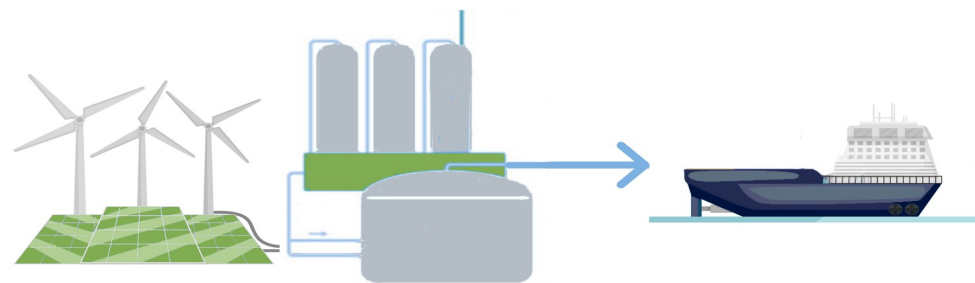
Indigenous communities are expected to play an important role in the development of these projects. Partnerships with these communities allows them to have a greater say in the project and monitor and mitigate the potential environmental impacts. The three wind farms planned for the first phase of the EverWind project are majority owned by Indigenous communities. Indigenous communities signed agreements with project proponents for equity partnerships and training that will support their economic development. Pabineau First Nation and the Eel River Bar First Nation are supporting the plans for a hydrogen facility in Belledune.



Initial green hydrogen demand will come from European countries looking to diversify their energy sources and high carbon industries reducing emissions. Projects proponents in this region are working to finalize offtake agreements with firms in Europe. Everwind and Pattern Energy have interest from German companies looking for cleaner energy solutions. Other proponents are working to finalize offtake contracts. Canada and Germany signed a green hydrogen alliance in 2022 and an agreement in March 2024 to work toward greater green hydrogen price certainty between the two countries which could accelerate new contracts.

As the hydrogen industry scales up it will lead to supply chain opportunities in the production, distribution and use of hydrogen in the region. This could include the manufacturing of components, wholesale and installation opportunities and repair and maintenance.

Significant spending will occur in the region as manufacturers, larger transportation providers and others adopt hydrogen. However, these investments are unlikely to scale up until costs of hydrogen fall and distribution networks for hydrogen are more advanced.



Main challenges to hydrogen projects

- > Currently higher cost compared to fossil fuels. Risk of cost escalation in the short term due to the scale and newness of the technology. High cost will limit demand for green hydrogen until technology matures to reduce cost.
- > Underdeveloped supply chains, with electrolysers and other main components requiring long lead times.
- > High global competition for production as dozens of projects around the world are planned.
- > Delays in implementing Canadian investment tax credits and other government support programs.
- > Ensuring the availability of construction workers during the construction phase and training individuals for new occupations to support hydrogen adoption.

Small modular reactors (SMR)

Our assessment of opportunities

Role in net-zero energy transition: **low in short term / moderate post 2030**

- > SMRs are being developed around the world. They have several potential applications such as electricity generation and industrial heat production. They could be deployed in remote locations, eliminating the need for costly grid connections.
- > New Brunswick Power is working with two firms to develop SMRs. These companies expect to be operational by the early 2030s. SMRs could help New Brunswick Power comply with the federal government's Clean Electricity Regulations.
- > Nova Scotia Power and Prince Edward Island are considering SMRs as an option for reaching net-zero by 2050.

Potential economic impact: **moderate with upside in New Brunswick**

- > The future economic impact in our region largely depends on the success of two SMR projects in New Brunswick – ARC Clean Technology and Moltex Energy.
- > ARC Clean Technology and Moltex Energy expect to be operational in the early 2030s.
- > The construction of those units and planned scaling up of activity for local or international use would create significant economic opportunities. New Brunswick Power estimates these SMR will create over 700 jobs per year, \$1 billion in GDP and \$120 million in provincial revenue by 2035.

Note: These assessments apply to Maritime provinces. Newfoundland and Labrador currently prohibits construction of nuclear power plants.

Role in the net-zero energy transition

Canada and the rest of the world are looking for low carbon options for baseload electricity generation. Nearly 100 SMR projects are in various stages of development globally. SMRs have lower electricity output and are much smaller in size than traditional nuclear reactors. Proposed projects in New Brunswick are 100-150 megawatts and 300 megawatts. Canadian nuclear facilities range from 500-900 megawatts.

SMRs can be deployed in remote locations, eliminating the need for billion-dollar investments to connect these areas to existing electricity grids. This could allow for more power-intensive manufacturing or mining to be built in rural areas. SMRs are a fast-acting baseload generation that is crucial to support intermittent renewables like wind and solar. They are scalable to match increasing energy demand. They are also safer to operate than traditional nuclear facilities and easier to build.

New Brunswick is the only Atlantic province with SMR projects under development

New Brunswick Power is working with two private-sector partners, [ARC Clean Technology](#) and [Moltex Energy Canada](#), to develop advanced SMR technology in New Brunswick. In 2018, New Brunswick Power and the two companies committed to invest \$20 million to research their advanced technologies.

ARC Clean Technology Project

The ARC-100 reactor is a sodium-cooled fast reactor that produces 100-150 megawatts of electricity, enough to support 75,000 households. ARC received \$25 million from the province in 2021 and \$7 million from the federal government in 2023. The company is seeking private funding.

The ARC-100 is a scalable small modular reactor. Several units can be grouped together to create larger generation hubs. Its components will be factory-built, assembled into modules at a fabrication facility and delivered to the site.

Construction is expected to begin in 2027 with first power produced in the early 2030s.



Moltex Energy Project

Moltex Energy Canada is developing the stable salt reactor – wasteburner. This is a fast molten salt reactor that can generate 300 megawatts of power using recycled nuclear waste as fuel. Moltex received \$50 million from the federal government in 2021 to advance its project.

This energy can be stored as heat and used to generate electricity when renewables are offline.

The first reactor is expected to be online in the early 2030s.



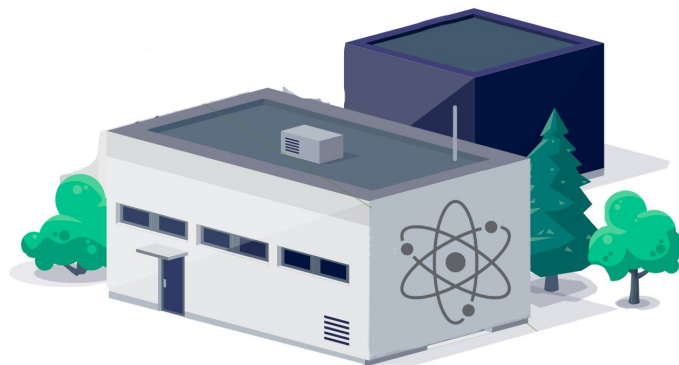
SMRs can also be used to produce industrial heat, hydrogen and medical isotopes. The [Port of Belledune](#) is considering adding a minimum of one gigawatt of heat and power using the ARC-100 SMR for industrial users on port lands by 2035.

Several partnerships are underway to support the advancement of SMR's. Ontario, Saskatchewan New Brunswick and Alberta are all part of [Natural Resources Canada's SMR Action Plan](#). [Saskatchewan](#) and [Alberta](#) have signed agreements to explore adoption of the ARC-100 reactor. ARC signed a [collaboration agreement](#) with Korea Hydro and Nuclear Power and New Brunswick Power for global SMR fleet deployment.

The [Darlington SMR project](#) in Ontario is expected to be the first to produce electricity in Canada in 2028. The Canada Infrastructure Bank provided a [\\$970 million loan](#) for the first phase of the project. This includes funding for project design, procurement of long lead-time equipment, utility connections, site preparation and project management requirements.

The federal government is [finalizing Clean Electricity Regulations](#) that will take effect in 2035. The ARC and Moltex SMRs would help New Brunswick Power comply with these regulations if they develop as planned. [New Brunswick Power](#) assumes SMRs are operational starting in 2029/2030 or in 2034/2035 in its base planning scenarios. Each base scenario includes 450 to 750 megawatts of SMRs. The provincial government set a goal of adding [600 megawatts of SMRs](#) at Point Lepreau by 2035.

Utilities in [Nova Scotia](#) and [Prince Edward Island](#) are also considering how SMRs can play a role in their path to net-zero emissions. Several of Nova Scotia Power's planning scenarios include about 450 megawatts of nuclear capacity by 2050. Nova Scotia [removed legislation that prohibits nuclear energy](#) being used in the province. Prince Edward Island [supports the federal Action Plan](#) and hopes to utilize SMR power either through purchase power agreements or through partnerships with other provinces. The [Electric Power Control Act](#) in Newfoundland and Labrador currently prohibits nuclear power.



Potential economic impacts in Atlantic Canada

ARC Clean Technology and Moltex Energy are scaling up operations in New Brunswick to prepare their projects for construction. New Brunswick Power registered the ARC Clean Technology project for the provincial Environmental Impact Assessment in June 2023. The utility also submitted a licence to prepare site application with the Canadian Nuclear Safety Commission to prepare an area next to its Point Lepreau nuclear facility for the ARC project.

If successful, these projects could be scaled up for domestic use, electricity export or SMR component export. New Brunswick Power estimates that the two SMR projects could create over 700 direct and indirect jobs per year, \$1 billion in GDP and \$120 million in provincial revenues between 2020 and 2035. The utility expects that these figures could increase five-fold by 2060 if the industry scales up and larger supply chains are developed in the province. The global market for SMRs is expected to reach over \$13 billion by 2032.

A 2023 supply chain study by Deloitte estimates that about 20% of the components can be manufactured in New Brunswick. Investment would be needed for firms in the province to manufacture reactor vessel and internals, electromagnetic pumps, heat exchangers, instrumentation and controls and condensers. The study sets a target of 80% supplied by New Brunswick firms if the manufacturing sector can be expanded. This will require significant investment in manufacturing and skills development.

Indigenous engagement has been a key focus for both firms in the early development stages. The Pabineau and Eel River First Nations expressed support for ARC's planned SMR project at the Port of Belledune. In 2023, the North Shore Mi'kmaq Tribal Council at their seven member communities signed equity agreements with ARC and Moltex. These agreements are important to ensure that Indigenous communities participate in the development of the industry and benefit from labour market opportunities.

The advancement of SMR production will lead to higher demand in certain occupations. Engineering activity will increase as projects move ahead. Supply chain coordinators and project managers will be needed once a project is given a green light. Trades like machinists, steel fabricators, welders, electricians, boilermakers and millwrights will be in demand once construction begins. Scientists and technologists will be required to ensure the safety and successful execution of the project.

The University of New Brunswick (UNB) is increasing its focus on supporting the SMR industry. The Centre for Nuclear Energy Research (CNER) at UNB is enhancing its research capabilities and is working closely with the SMR proponents. The expanded research focus could lead to new commercialization opportunities in the province. UNB has relaunched its nuclear engineering program with a focus on SMRs.

Electricity grid and transportation infrastructure will need to be enhanced if SMR construction expands. Transmission upgrades will be needed to carry higher loads if New Brunswick produces electricity with SMRs for export to other provinces or the US. Roads, rail and port infrastructure may need to be improved to ship components from manufacturing sites to fabrication sites in New Brunswick or to other jurisdictions.

The high capital costs are a major impediment to the pace of SMR development. [Wood Mackenzie](#) estimates that initial versions of SMRs will cost US\$6,000-\$8,000 per kilowatt. That equates to about \$800 million to \$1.1 billion, in Canadian dollars, for a 100-megawatt project. The average [installed cost of wind](#) was about US\$1,400 per kilowatt in 2022. SMRs are unlikely to grow rapidly as a source of energy generation until development costs fall. Governments will look at ways to support research and early-stage capital costs to improve project feasibility. Raising the financing required for billion dollar or multi-billion dollar projects will be challenging until the technology's scalability is proven.

The private sector is the primary funder of SMRs whereas governments largely funded traditional nuclear facilities. However, governments and government-owned utilities are still heavily involved. They must ensure appropriate regulations are in place, assess the impact on the electricity system and taxpayers, and oversee the collaboration with other stakeholders. Governments may have to continue to take on financial risk to ensure projects move ahead in the early stages.

Public perception of the nuclear industry can be a challenge. However, New Brunswick has a long history of safely producing nuclear power in the province. A recent Angus Reid poll showed that 63% of New Brunswickers support the expansion of nuclear power in the province. The proposed [SMR technologies are safer](#) and require less monitoring than traditional nuclear power.

Main challenges to small modular reactor projects

- > High capital costs and related financing challenges for a developing technology
- > Greater interest in funding and developing other more proven and lower-cost clean energy technologies
- > Complex and time-consuming regulatory processes to initiate development of SMRs
- > Need to scale up manufacturing and supply chains to support economic development opportunity
- > Public perception of nuclear development
- > Removing the legislative barrier to development in Newfoundland and Labrador

Battery storage

Our assessment of opportunities in Atlantic Canada

Role in net-zero energy transition: **moderate**

- > Battery storage is seen as an important component of the energy transition, largely to support electricity production and transmission efficiency but also for transportation and back up power for homes.
- > A few projects have been implemented or announced over the last few years including municipal utility storage projects in Saint John and Summerside. Nova Scotia Power announced a larger project in 2024.
- > Battery storage systems will likely grow in importance to complement expanding intermittent electricity generation.
- > Increased adoption of batteries by consumers and industries will reduce emissions. An integrated energy system involving homes, vehicles and industries would help meet peak electricity demand periods.

Potential economic impact: **low to moderate**

- > Utility battery storage projects will unlikely have a large economic impact in the Atlantic economy in the short-term. Most of the technology is expected to be imported.
- > If the region scales up the use of battery storage in integrated energy systems it would lead to increased employment for installation of those systems. It could also create revenue opportunities for households and industry.
- > Economic activity may benefit if Atlantic Canada increases its focus on battery storage for marine uses. The installation and integration of more battery storage in industries like the fishery would create new jobs and potential export opportunities.
- > Supply chain opportunities may arise for battery manufacturing including critical minerals.

Role in the net-zero energy transition

Battery storage comes in many forms. Electric batteries to power cars and in homes to store solar energy has been growing but has shown some signs of slowing. Electric car producers are slowing production of electric vehicles and returning more focus to hybrid vehicles. Consumers are citing the lack of charging infrastructure and battery performance in colder climates as an impediment to adoption.

Sales of electric vehicles in New Brunswick and Prince Edward Island remain brisk, up 69% in 2023 compared to the previous year. Hybrid and plug-in hybrid sales were up 105% in those two provinces in 2023. Gasoline power vehicle sales are still growing by 12% in 2023 but much slower than those with lower or no emissions. In Newfoundland and Labrador the number of electric vehicle registrations increased by 76% in 2023 to over 1,240.

The batteries in electric vehicles can be used to support peak demand periods for utilities. Owners of electric vehicles would get paid by the utility to use the stored electricity to help improve the flexibility of the grid. The bidirectional charging could be an important part of the grid in the future as electric vehicle adoption increases and electricity demand rises overall. Nova Scotia Power and New Brunswick Power have implemented advanced metering infrastructure (AMI) that can support this technology. Maritime Electric in Prince Edward Island is awaiting regulatory approval to start installing AMI in homes later this year.

The Smart Grid program in Nova Scotia includes installing backup battery storage in homes. This will allow homes to have a source of backup power during power outages. The utility can also draw down power from the batteries during peak demand times and supply power to the batteries leading up to bad weather events. The batteries used in homes to store energy from solar panels could also be sold back to utilities. As the technology improves and costs come down there may be more adoption of battery storage in homes as an alternative to gas-fired generators and in industry to replace diesel generators.

Integrated energy systems are expected to be important to the energy transition. Efficient use of electricity would limit the amount of additional infrastructure needed to meet expected growth in demand. The Intelligent Feeder project will connect 10 homes in the Elmsdale area with Tesla Powerwalls. This is supported by a larger grid-sized battery at the Elmsdale substation and wind turbines. For larger scale adoption by consumers and industry an attractive pricing system would need to be implemented. There is unlikely to be any investment until regulations and pricing are adjusted to allow for revenue certainty.

Grid level energy storage is growing but costs remain high and the technology is evolving. Nova Scotia Power announced a \$354 million, 150 megawatt battery storage project in early 2024. The city of Summerside recently completed a solar/battery storage project that includes 21 megawatts of solar along with 10 megawatts of battery storage. Saint John Energy launched a smart grid pilot project in 2022 that included a Tesla Megapack battery. The company also added 5.8 megawatts with two hours of battery storage as part of its Burchill Wind Energy project.

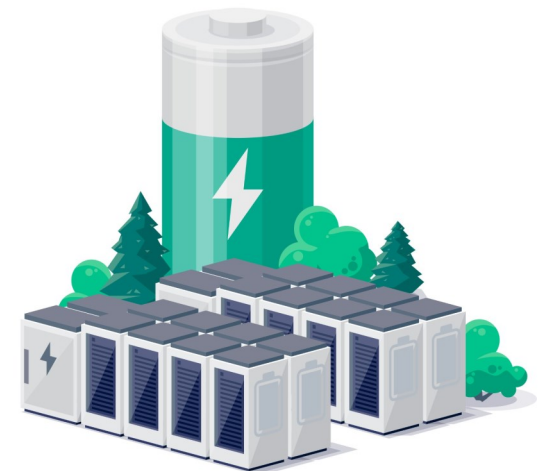
Nova Scotia Power is implementing the largest battery storage project in the region

The utility's project will include sites located in Waverley, Bridgewater and in Kings County that will be online in 2025 and 2026. Each of the sites will have 50-megawatts of four-hour immediate demand response and are located next to major substations. The Wskijnu'k Mtmo'taquuow Agency (WMA), the economic development organization that represents all 13 Mi'kmaw communities in the province, is making an equity investment in the project. The Canada Infrastructure Bank is providing \$138 million in loans for the project including \$18 million to support the WMA investment. Construction jobs will be created to build the facilities but many of the core components will be built in other countries. Local opportunities will arise for engineering, civil construction, transmission interconnection and other materials.

These projects can help supply power during peak demand, reducing the need for extra generation capacity and helping to reduce greenhouse gas emissions. Batteries can also store power that can be used when intermittent energy like wind and solar is unavailable and reduce transmission congestion. Battery storage has a fast response time which can support energy security. Batteries can be charged during low demand times and can be quickly discharged during peak demand.

The Nova Scotia government is planning to add another 150-250 megawatts of battery storage to the grid through a competitive bidding process. The province recently announced changes to electricity regulations that will see an independent systems operator created that will be responsible for the bidding process. New Brunswick Power is seeking proposals for up to 50 megawatts of battery storage as part of its 2023 expression of interest.

Canada signed an agreement in December 2023 with the US, Australia and the European Commission to cooperate on battery storage technology development. India and several African and Caribbean countries signed a similar agreement. These initiatives are to help other parts of the world compete with China which is currently a dominant player in battery development and manufacturing.



Potential economic impacts in Atlantic Canada

The economic impact of installing utility-grade battery storage is limited as much of the technology is imported. There will be engineering work to plan the projects and civil work to prepare the sites. Certain components would be sourced locally and electrical workers would be needed to connect the project to the grid.

The future economic impact for Atlantic Canada will depend on whether the region's firms are able to supply the growing industry. The use of batteries may also lead to new opportunities in the region such as electric fishing vessels. The battery storage technology would be part of the supply chain for boat builders in the region. Charging infrastructure would also need to be developed in the region's ports.

ABCO Industries of Lunenburg, NS launched its first electric commercial vessel in partnership with Rimot of Halifax in 2023. Rimot is researching technology to turn electric marine vessels into power plants for utility energy storage. Salient Energy of Dartmouth is developing a zinc-ion battery as an alternative to lithium batteries. Novonix manufactures anode and cathode materials for lithium-ion batteries. Zen Energy is developing battery storage applications for marine, transport and residential uses. Glas Ocean provides hybrid electric kits for boats and provides data analysis on performance.

There may be supply chain opportunities for battery storage project in the region. Critical minerals such as lithium, nickel, cobalt and iron for steel production are key to the development of batteries. Atlantic Canada has several projects that could be advanced to support the national supply chain. The region should examine other supply chain opportunities in the development of battery technologies.

Main challenges to battery storage projects

- > Costs remain high compared to other types of renewables although there has been improvement over the last decade
- > Battery storage duration needs to improve to make it more effective for the energy system
- > There are long lead times for components in the supply chain as demand for battery storage for utilities has grown
- > Attractive pricing will be needed to encourage consumer and business uptake for integrated energy storage systems

IMPLICATIONS FOR ATLANTIC CANADA'S ECONOMY IN THE PURSUIT OF NET-ZERO EMISSIONS

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- > [Overcoming Obstacles to a Cleaner and Bigger Electricity System](#)
- > [What is the Future of Oil Refining in Atlantic Canada?](#)
- > [Laying the Foundation for Net-zero Buildings](#)

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- > [Industry Dive: Agriculture](#)
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info@atlanticeconomiccouncil.ca
www.atlanticeconomiccouncil.ca
X: @atl_econcouncil

Key takeaways

- > Governments will need to continue derisking investments in these technologies through policies and incentives. The amount of government funding in the early stages may need to rise to keep momentum going.
- > Stakeholders need to better understand where supply chain development can be advanced in Atlantic Canada to maximize the economic impact of these technologies within the region.
- > Manufacturers should examine potential future uses of these technologies to support emissions reductions. Partnerships with universities to examine the use in core processes should be considered.
- > Governments and stakeholders should work together to define the scope and value of a Green Hydrogen Hub in Atlantic Canada.
- > Proponents should ensure Indigenous participation in the development of these technologies and work with Indigenous communities to see how they could best be deployed to meet their clean energy needs.
- > Labour needs for emerging industries should be assessed by proponents. They should work with post-secondary education to develop or adapt appropriate programs.