



# Powering Growth

Building New Brunswick's Energy Future



**Énergie NB Power**

# Powering Growth

Creating a future as postcard perfect  
as New Brunswick itself.

A place to  
play, work  
and grow

New energy technology research for Advanced Small Modular Reactors will create electricity that protects our environment as it develops a new generation of highly-skilled workers and commercial opportunities to power our economy.



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# About the Advanced SMR Nuclear Energy Cluster

# On June 26, 2018 the New Brunswick government committed \$10 million

toward development of an Advanced SMR Nuclear Energy Research Cluster.

In separate announcements, two private companies — Advanced Reactor Concepts (ARC) and Moltex Energy — committed \$5 million each to fund activities within New Brunswick to explore the development, licensing and construction of Advanced Small Modular Reactors (SMRs) at the Point Lepreau site and to establish research and development teams in New Brunswick. The cluster will focus on both the generation of clean electricity for New Brunswick and for export to neighbouring jurisdictions looking to gain the benefits of low-carbon electricity. As well, the partners will explore commercial opportunities to manufacture and export the technology, our expertise and components across Canada and around the world.

Other provinces and countries are also looking to use this flexible generation option to address climate change. New Brunswick's workforce is well-positioned to provide it. Through further research and development, an opportunity exists to construct and operate a commercial demonstration plant to attract scientists and engineers from around the world while creating new jobs in construction, research, manufacturing and operation. In short, this new technology will provide sustainable electricity and will **power New Brunswick's growth.**

# Building on our strengths

**Today, nuclear power is fueling our province's economic growth.**

At Point Lepreau and in communities across New Brunswick, about 2,700 people contribute to the generation of safe, low-carbon electricity that powers our lives and our economy.

Advanced nuclear research will build on what we are already achieving together.

# GROWTH



# Electricity generated from nuclear already can account for up to 60 per cent

of all electricity used in New Brunswick on a given day.

That means nuclear powers almost two out of three light bulbs, schools, hospitals and workplaces. And, it doesn't just light up our lives. It is also a driving force for our economy. The Point Lepreau Nuclear Plant:

- contributes \$767 million to goods and services bought and sold in the province
- adds \$287 million annually to the province's GDP; and
- contributes \$29 million in revenue to the province that can be spent on important services to communities, province wide.

It does all this, and is helping New Brunswick achieve its climate change action plan targets to ensure a more sustainable environment for generations to come.

Leading through  
new technologies,  
existing expertise  
and collaboration

**A job made for New Brunswickers.**

With a long history of nuclear energy expertise, manufacturing experience and burgeoning centres of clean tech and entrepreneurship, the province has all the ingredients to lead on this important new energy technology.



# INNOVATION

# New Brunswick has deep expertise in nuclear technology, as well as

manufacturing, construction, shipping and exporting.

In recent years, we have added to that with a burgeoning clean tech industry and a growing STEM (science, technology, engineering and math) research and training capacity in our universities and colleges. And, through its Canadian supply partners, NB Power has a reliable and capable supply chain.

NB Power has a long history of innovation, employing new technologies to improve both the generation and delivery of electricity to better serve our customers. We also have a

clear and measurable action plan to meet climate change targets that will set us on a strong path to not only prepare for the future economy but to lead it.

A low-carbon electricity grid will change more than how we get our power. It is a foundation for our entire infrastructure network from transportation to healthcare. At NB Power, we know how to use nuclear technology to make a better world. We have already been doing it, safely and effectively, for 35 years.



# About Advanced Small Modular Reactors

# The growing interest in advanced small modular reactors came from recognition

of the value of nuclear to safely generate low-carbon electricity reliably and inexpensively.

The desire to capture those benefits in smaller, scalable units with additional flexibility, simplicity in design and less upfront construction time and cost, among other features, has driven development of SMRs.

There are many types of SMR technologies. New Brunswick and NB Power are currently considering reactors with two private-sector partners, Advanced Reactor Concepts (ARC) and Moltex Energy.

ARC is currently working towards development of a 100-megawatt Sodium Advanced SMR. The company uses

proprietary PRISM technology from GE Hitachi Nuclear Energy and works with support from that company's engineering and design teams.

Moltex Energy's stable salt advanced reactor technology uses previously-used fuel, which could potentially make use of existing CANDU spent fuel from Point Lepreau. It is designed at a nominal output of 300 megawatts, scalable to 1,000 megawatts.

# Building a clean energy grid one step at a time

The small but scalable size of SMRs means affordable capital projects that can be as small, or as big, as needed with shorter timelines and less upfront capital commitment.

# SCALABLE



# Small, scalable nuclear plants offer greater flexibility

for a number of uses within New Brunswick's power grid.

They provide the province flexibility to build only as much supply as demand warrants. Yet, it keeps the option available for added power in quick construction timelines, as the province's electricity needs grow with its economy.

The scalable reactors also allow New Brunswick to use its ideal geographical position to export power to other jurisdictions, adding revenue for the province while giving other Canadians and neighbouring U.S. states, availability of low-carbon electricity.

With SMRs as part of a low-carbon mix, New Brunswick can manage its capital costs as it scales up to electrify additional infrastructure such as its transportation network. SMRs are one more piece, along with existing baseload CANDU-6 nuclear technology as well as hydro, wind and solar to achieve the province's Climate Change Action Plan. The Advanced SMR's ability to build up in increments, to vary in electrical output and integrate with renewables means it can follow the needs of the grid to create exceptional flexibility.

# SMRs pinch-hit when the weather doesn't cooperate

**SMRs** are environmentally-friendly. They are also friendly to renewable energy sources like wind and solar because they can help fill in when the sun doesn't shine or the wind doesn't blow.

# LOAD FOLLOWING



# One of the challenges of managing an electricity system is keeping

electricity generation coming onto the grid smoothly and reliably to meet the peaks and valleys of demand.

This is further complicated by generation methods that are susceptible to the unpredictability of the weather conditions. Currently, load-following electricity sources like natural gas are used to fill in the gaps.

As a low-carbon, electricity source that is easy to bring on and off the grid

incrementally as needed, Advanced SMRs can fill in the gaps caused by the fluctuation in generation levels of renewable energy sources. And, they can do it without adding any unwanted greenhouse gas emissions or air pollution into the mix.

# Putting our manufacturing knowledge to work for a new generation

The energy research cluster will look at development of opportunities for manufacture and export of Advanced SMR components to other jurisdictions creating a clean energy future for the world and high-skill jobs in New Brunswick.

# KNOWLEDGE



## Within New Brunswick today exists the expertise and infrastructure

to further develop the knowledge, skills and facilities to lead globally in new and emerging technology sectors, including Advanced SMR generation and manufacturing.

Thanks to its existing experience with nuclear power through generation at Point Lepreau, on-going work at the University of New Brunswick's Centre for Nuclear Energy Research (CNER) and a well-developed supply chain and labour force, New Brunswick is well placed to lead in the emerging Advanced SMR sector.

The energy research cluster will look at the potential for New Brunswick to create a manufacturing centre that would use the province's highly-developed transportation systems, including its deep water ports and related shipping expertise, for export of Advanced SMR components to other parts of Canada and internationally.

# Electricity that safely powers what is most important

**SMRs are inherently safe by design.**

You don't want to have to think about your electricity. The stable and simplistic design of SMRs means you don't have to. They are safe for people and for the environment.



# SAFE

# SMRs' safety comes from an inherently passive design that requires very little operator control.

Through the laws of physics, the system automatically shuts off should shutdown be required.

The design requires very little human intervention making an SMR an ideal choice for many locations and uses.

Advanced SMRs are also a sustainable choice for the environment. In addition to their low-carbon properties, they can replace fossil fuel sources in both on and off-grid applications and can also be built for combined heat and power applications.

Like other nuclear technologies in Canada, should SMR technology be deployed, it would be regulated by the Canadian Nuclear Safety Commission. The CNSC is a well-respected, experienced, world-class nuclear regulator. Both designs being studied as part of New Brunswick's nuclear research cluster efforts are currently undergoing the Vendor Design Review through the CNSC's early assessment program.

# Reducing our footprint for future generations

## **Less waste with a shorter shelf life.**

Innovation improves our lives and that is what our Advanced SMR research is intended to do. SMRs have the potential to significantly reduce the electricity generation footprint. We want to keep it as small as possible for future generations.



# Canada has a long-standing waste management plan for long-term

management and storage of spent fuel.

However, we know waste from electricity generation, whether it is through air emissions from fossil fuels, waste from spent solar panels and wind turbines or nuclear spent fuel, is a concern for Canadians. Advanced SMRs reduce the amount of nuclear waste generated from their operation and they reduce the time it needs to be isolated from the environment. In some cases, there is potential for SMRs to generate

electricity from recycled spent fuel creating an additional use before the remaining reactive material needs to be managed.

As part of the research cluster activities, researchers will focus on better understanding the use of spent fuel to power SMRs and to further reduce all waste generated from their operation.



A common vision  
for a shared future

## Keeping you at the forefront, just as we always do.

New Brunswick Power is a company owned by the people of this province. You are NB Power shareholders and we want to incorporate your views into everything we do.

We will continue to engage with First Nations communities and New Brunswick citizens across the province as we progress with research for Advanced SMR development and consider this technology for potential deployment as part of the province's electricity system.

As well, we will be engaging partners in industry, academia and government across New Brunswick, throughout Canada and around the world. We will make this a project inclusive to everyone who can benefit from our research and potentially from the export

of clean electricity or prefabricated SMR components. This will include welcoming the international scientific community to visit New Brunswick and to bring their own expertise to our province.

NB Power also participates on the Canadian Nuclear Roadmap to 2050 and SMR Roadmap committees. With other industry participants and in consultation with the government of Canada, NB Power is collaborating to create the right conditions for energy innovation that will benefit the Canadians of tomorrow.



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