Project Summary Report

Understanding how customers, energy technology and utility programs can support a cleaner, affordable and secure energy supply for generations

PROJECT OVERVIEW

In 2018, NB Power launched a major research project with partners Siemens, the National Research Council of Canada and the Town of Shediac to understand how customers can use technology to save energy and bring more renewable energy to the electricity grid. The idea for the project originated with community leaders in Shediac.

> *'I want to do the right thing and contribute to the fight against climate change'*
> *~ project participant*

The Shediac Community Energy Community Project had three parts.

The **Residential Energy Study** included more than 500 Shediac homeowners, the majority of whom received and tested various types of energy technologies including smart meters, solar and battery storage, cold climate heat pumps, smart thermostats, and smart water heaters, and also tested time-of-day rates. Approximately 100 households participated in the study without smart energy technology as a baseline.

The project **converted two commercial buildings to net zero**, adding solar panels, battery storage and energy efficiency upgrades to the Shediac Multipurpose Building and the Government of Canada Pension Centre. The buildings tested technology developed by Siemens to send solar energy to the grid at peak times, while shifting heating and cooling to reduce energy use without affecting comfort.

The project also built a **Community Solar Farm**, NB Power's first grid-connected 1.63 megawatt solar farm, providing clean energy to the retrofitted buildings and the Town of Shediac.

To support customers involved in the project, NB Power opened a storefront office in Shediac staffed by bilingual team members dedicated to responding to questions and troubleshooting technology issues, and launched an online portal with additional project information, personalized energy use data and efficiency tips. The project team also hosted in-person workshops in English and French with participants in the time-of-day rate study to ensure broad understanding of how to benefit from the program.

Energy use data was collected until March 2024, with customers providing additional feedback through regular surveys and in-person workshops.

At the end of the study, customers gave high satisfaction marks to NB Power for project communications, customer service and technology support. Customers also said they would be willing to adopt new technology and behaviors to save energy and money, with cost, incentives and energy education factoring in their decision-making.

05/2022

WHAT DID NB POWER WANT TO KNOW?

- How best to integrate renewable energy into the electricity grid
- Whether cost savings are achieved when NB Power customers use smart energy technology at home
- What customers think about various kinds of energy technology
- What are the effects of variable time-of-day electricity rates on customer bills and peak electricity demand

WHAT IS PEAK DEMAND?

Peak demand is when demand for energy from the grid is highest and supply is limited. In New Brunswick, this typically happens on cold winter mornings between 7-9 am, with a second but smaller peak in the evening, typically between 4-6 pm.

TIMELINE

2018	Shediac research projects launched
2019	500+ homeowners recruited
2020	Homes assessed for technology Site preps for solar farm
2021	Commercial buildings projects begin
2022	Home tech installs completed Commercial buildings completed
2023	Data collection for all projects extended to 2024
2024	Data analysis and results reporting begins
2025	final results published; research findings are being put into practice

The Shediac Community Energy Project is the largest and most detailed energy research project of its kind in Atlantic Canada. It demonstrates how NB Power is working with partners and customers to ensure New Brunswick's electricity grid will be cleaner, more cost-effective and secure for generations to come. The project is already providing important benefits to customers and the utility.

KEY FINDINGS FOR CUSTOMERS

Set it and forget it

The best and easiest way for New Brunswickers to save money and energy at home is by installing cold climate, high-efficiency heat pumps (rated to -25 C) set at consistent temperatures all day.

> *'Set it and forget it makes sense to me after the great discussion today.'*
>
> *'I am already doing the set and forget it - good for me!'*
>
> *~Workshop participants*

Knowledge saves energy and money

When New Brunswickers know how to save using technology and time-of-day rates, they will change their habits to reduce their bill and their energy use.

> *'Every little bit helps'*
>
> *'This session makes me feel like I'm doing something right by watching my energy consumption'*

Solar and battery provide multiple benefits

In compatible homes, solar panels and battery storage can provide bill savings and reliable, essential backup power during outages.

KEY FINDINGS FOR THE UTILITY

Simple solutions have the biggest impact on peak demand

Cold climate, high-efficiency heat pumps (rated to -25 C) are an easy, low-cost option to reduce demand on the grid during daily peaks (morning and evening).

> *'I didn't know that we use more fossil fuels in the winter, or that turning my thermostat down at night means we need to generate more power in the morning. I'll give 'set and forget' a try and see if I can reduce my peak'*

Large energy users can help reduce peak demand with complex technology

Commercial customers can successfully save energy, contribute renewable energy to the grid and reduce peak demand using energy management technology in collaboration with the utility.

Customer insights and project data supports evidence-based utility decisions

The project tested energy technology, rates and customer perceptions, producing a wealth of data to help NB Power make evidence-based decisions to meet climate and affordability goals, and secure our energy supply for generations.

Project Results

RESIDENTIAL ENERGY STUDY

Customers were divided into groups based on their home design and heating type and assigned various types of energy technologies, or no technology at all, by the National Research Council. This included solar panels and battery storage, cold climate mini-split heat pumps, smart thermostats and smart water heater devices. Some households also tested time-of-day rates, where energy cost more during peak energy demand times between 7-9 am.

Solar and Battery Storage

Seventy-five homes received solar and battery storage technology.

The homes generated an average of 5000 kilowatt hours (kWh) of renewable energy during the study period.

Total annual greenhouse gas emissions (GhG) reductions for all participants during the study period was equal to 109.9 metric tons of C02.

Average annual bill savings for homes not participating in the time-of-day rate program was $358.

What did customers say?
Customers value having backup power from battery storage, especially during extreme weather events, but have limited willingness to pay the upfront technology and installation costs (majority would need 50 per cent subsidy).

Smart Thermostats

More than 400 homes in the study received smart thermostats, from various manufacturers.

All homes showed a small reduction (less than half a degree Celcius) in their temperature setpoints during the study period, indicating small savings of energy and money.

What did customers say?
In general, customers liked the smart thermostat technology (74 per cent satisfied). However most customers needed help with service support (programming and troubleshooting the device) along with education to get the benefit from the technology.

Cold Climate Heat Pumps

Twenty three homes in the study received a high-efficiency cold climate mini-split heat pump with a coefficient of performance (CoP) of 2.13 at -25 Celsius.

During the study period, these homes reported energy savings of 10 per cent, increasing to 12 per cent in winter, with the heat pumps set at consistent temperatures all day.

These homes also contributed to a 16 per cent reduction in peak electricity demand.

What did customers say?
In general, customers were satisfied with the cold climate mini split heat pump technology, and after the installation, required very little help to enjoy the benefits.

Time-of-Day Rates

A portion of customers in all technology and no-technology groups were enrolled in an experimental time-of-day rate program, with higher rates set for peak demand times. Customers enrolled in the program received tips on how to use electricity more efficiently during off-peak times and monthly shadow bills showing how they might have saved, or paid more, depending on their usage. Customers who saved on their shadow bills received an equivalent credit on their actual bill. Customers who would have paid more under the program were not penalized.

All customers enrolled in the time-of-day rate program showed energy savings of between 2.4 to 2.5 per cent. The average impact on customer bills was zero, however some customers received credits as large as $21, and others could have been charged as much as $47 had penalties been applied.

Homes with high-efficiency cold climate heat pumps showed energy savings of 3.9 per cent from time of day rates.

Homes enrolled in the time of day program with solar and battery technology were programmed to rely on battery storage for energy supply at peak times, unless signalled by NB Power to send electricity to the grid. For this reason, these homes contributed the most to peak demand reduction (up to 75 per cent) and experienced the highest annual energy and financial savings under the time-of-day program.

For the remaining homes without cold-climate heat pumps or solar and battery technology, the time-of-day rate program contributed to a peak demand reduction of 3.3 per cent during winter months.

What did customers say?
At the end of the study, a majority of participants (80 per cent) responded that they would sign up for a time-of-day rate program if NB Power offered it. Of those who would not, nearly half said 'my daily schedule is complicated enough without changing it.'

Customers enrolled in the time-of-day program needed consistent online and in-depth in-person education and reminders about how to benefit from time-of-day rates. The benefits resulting from this education effort (in-person workshops, energy saving tips shared via email and online) declined year over year during the study period. This decline suggests customers will need ongoing reminders and engagement to experience continued benefits from time of day rates.

Commercial Buildings and Solar Farm

Shediac Multipurpose Building and the Government of Canada Pension Centre both received rooftop solar and battery technology upgrades. The buildings also tested technology developed by Siemens that enabled NB Power to send solar energy to the grid at peak times, while shifting heating and cooling to reduce energy use without affecting comfort.

Both buildings have **received their net-zero performance certification by the Canadian Green Building Council.** Another goal is to better understand how grid-connected buildings can provide value to customers and the electricity grid.

The effort was supported by NB Power's first grid-connected 1.63 MW solar farm, commissioned in February 2023. The farm included 169 tables and 4056 solar panels, built within town limits and connected to NB Power's local distribution system.

The Government of Canada Pension Centre realized total savings of $16,000 annually with help from the battery and related technology and a dedicated team of onsite energy managers.

The Shediac Multipurpose Centre lacked similar onsite expertise, and experienced less savings and more technical challenges.

The technology contributed to average peak demand reduction of 15 per cent in winter, 13 per cent in summer and 19 per cent during the shoulder seasons. The people who used the buildings for work and recreation did not complain about being cold or hot at any time during the study period.

What did customers say?
Commercial customers need support to understand their energy needs and benefit from complex, grid-connected technology. Large commercial customers with onsite energy managers are most likely to benefit from large-scale solar and battery programs, saving energy and money and contributing to peak demand reduction without sacrificing comfort for people who use the building.

Conclusion

This project shows how NB Power is making careful investments with customers and technology to advance on a path to net zero energy supply.

NB Power will apply learnings from this project to improve its operations, investments and programs to be sustainable now and into the future.

The results will also be shared with other energy utilities and stakeholders in the energy sector to develop best practices and support the world's path to net zero energy.

NB Power is grateful to the Town of Shediac, its partners and collaborators and especially to the hundreds of residential customers who participated in this project, and proud that the town is moving forward to become New Brunswick's first net-zero community.

Thank you for joining this journey. This work is helping to ensure all New Brunswickers have a cleaner, more affordable and secure energy future.

Partners for the project include: NB Power; Siemens, the Town of Shediac; and the Government of Canada through Natural Resources Canada, Innovation, Science and Economic Development Canada, and the National Research Council of Canada.

The project is also part of Smart Grid Atlantic, a four-year, federally funded initiative supporting energy technology projects in Nova Scotia and New Brunswick.

— PARTNERS —

J'ME SENS | FEELS LIKE Shediac

Énergie NB Power | the power of possibility débordant d'énergie

SIEMENS

— FUNDERS —

Innovation, Science and Economic Development Canada
Innovation, Sciences et Développement économique Canada

Natural Resources Canada
Ressources naturelles Canada

— RESEARCH PARTNERS —

National Research Council Canada
Conseil national de recherches Canada