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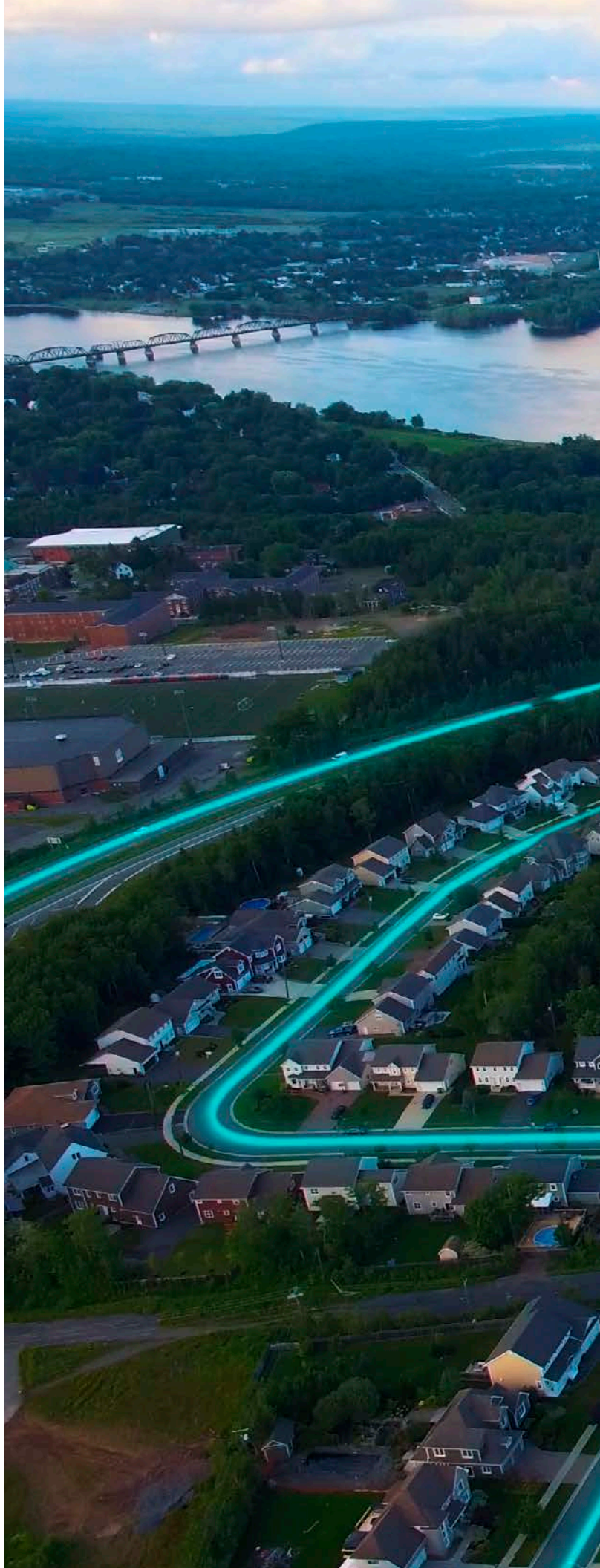
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**SIEMENS**

*Ingenuity for life*

**NB Power**

**Ingenuity for life – Case Study**

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# Siemens ingenuity transforming NB Power

Electrical utilities throughout the world are in the midst of profound change. New forces are disrupting traditional business models. No longer is there a universal system with utilities providing electricity to consumers and businesses in a rigid, highly regulated, unidirectional manner. Instead, a decentralized marketplace is opening up. Multiple new sources of power are available and customers are actively participating in the process.

Today, communities can produce – and consume – their own electricity. Customers have different needs and expectations. They're looking for products and services that give them greater control over their electricity and their bills, while enabling them to take advantage of new technologies. And they want to reduce their impact on climate change.

Serving more than 394,000 customers in New Brunswick and employing approximately 2,300 people, **NB Power** is boldly embracing the challenge of operating in this fast-changing environment. Striving to be at the industry's leading edge, the company is transforming itself from top to bottom.

The ultimate objective is to give customers the most consistent electricity service possible – with maximum uptime and minimum of outages. At the same time, it's also about putting them in more control of their energy costs and consumption, and allowing them to embrace newer renewable and more environmentally-friendly forms of energy.

Getting there requires a staggering degree of ingenuity. It's why NB Power is collaborating so closely with Siemens Canada in a special partnership that is defined by innovation.

## Ingenuity for life with Siemens and NB Power

NB Power's customers are reaping the benefits of the utility's transformation

- NB Power leveraging Siemens comprehensive Compass methodology and employee expertise, based on an extremely close working relationship between integrated teams of Siemens and NB Power employees
- approximately 150 "smart grid" initiatives underway, including introduction of intelligent load management software to help customers lower their energy costs by reducing and shifting demand for electricity
- innovations in data analytics and other software mean more consistent service, fewer outages and more uptime, as well as a future of greener energy
- Siemens support includes major commitment to ingenuity in New Brunswick
- Global Centre of Competence for smart grid
- Research and Development office
- Smart Grid Innovation Network, with collaboration among Siemens, NB Power and the University of New Brunswick

## Consumers and businesses empowered to control their energy future

### Siemens ingenuity empowers NB Power customers

NB Power is shaping their future by undertaking a massive “reduce and shift demand” program.

This program combines “demand response” and “load shifting” initiatives – which aim to decrease electricity consumption and move it from on-peak to off-peak periods – by utilizing customer incentives and new technology. It means customers can take more control over their electricity consumption and bills, including not having to pay for electricity they do not need.

“If you think about the first 100 years of NB Power, we generated, transmitted and distributed electricity and we never cared what happened after those electrons went to the meter on the wall of someone’s house – we just counted up the number and sent the bill,” explains Brad Wasson, Director of the Reduce and Shift Demand Program at NB Power. “But where the world is going, it’s giving customers control over those electrons because they want to better manage their electricity use and electricity bills.”

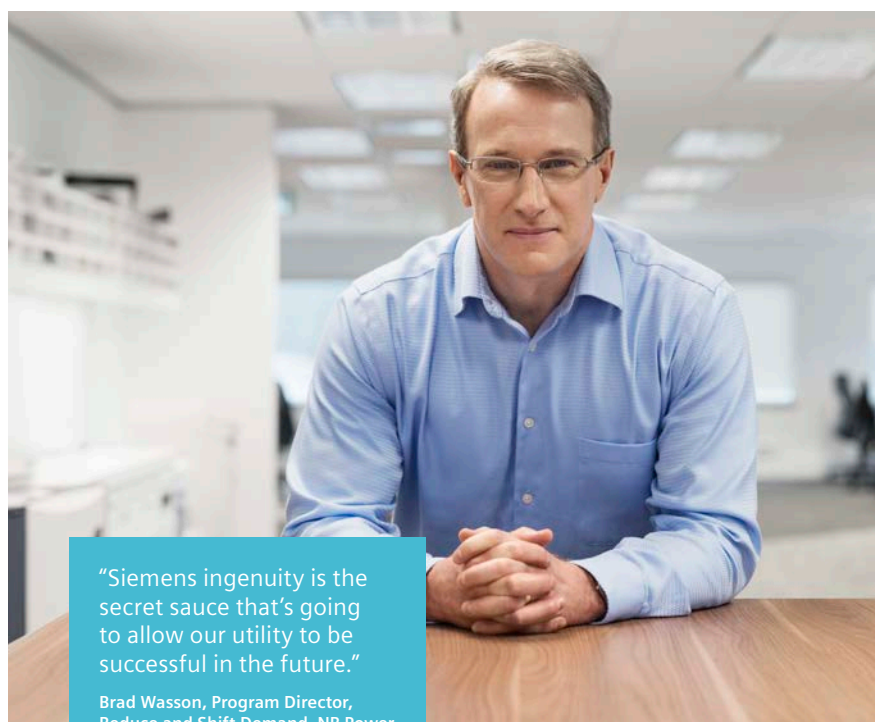
Amplifying that point, Tim Gibson, Vice President of Smart Grid at Siemens Canada, said he is increasingly hearing that message from electrical utility companies throughout the world.

“If you had asked executives of those organizations a couple of years ago about smart grid, they’d have said it’s a great technology play to dabble in,” Gibson notes. “But now they foresee it

driving fundamental change to their business model. With everything the people at NB Power have done already, they are way ahead of the game. We’ve had delegations from all over the world come to New Brunswick to learn about what NB Power is doing and their first reaction is always ‘wow’ when they see what is happening.”

For NB Power, their new model is playing out in a variety of ways. At the top of the list, tools such as usage reports,

in-home energy displays, and smart phone apps are driving consumer empowerment – all underpinned by extremely granular customer segmentation work to make sure each customer has the most impactful education possible on their changing relationship with the utility. Longer term, time-of-use rates and other financial incentives are expected to offer mutual benefit to both the utility and the customer in better managing energy use.



“Siemens ingenuity is the secret sauce that’s going to allow our utility to be successful in the future.”

Brad Wasson, Program Director,  
Reduce and Shift Demand, NB Power



### Smart grid innovation from Siemens

Siemens innovation makes all of this possible. Building the smart grid involves approximately 150 specific initiatives, with dozens of NB Power and Siemens people directly involved. They are supported, as needed, by dozens more Siemens experts from around the world.

On the technology side, NB Power is rolling out intelligent load management (ILM) software. Wasson refers to it as NB Power's "virtual power plant," adding that it has become the core operating system of the entire NB Power enterprise.

One important function of ILM is to enable customers to control the amount and timing of electricity used by specif-

ic devices. This has exceptional potential to help NB Power customers, by reducing their overall energy use to save them money. Already, new demand-management concepts – such as smart thermostats and smart water heaters – have been piloted with customers in advance of planned wider-scale rollouts.

"The results were very positive; customers really liked what they experienced in the pilots, so we're really excited about the potential," describes Wasson. "As far as we know, we're as far ahead in the world doing this type of operation as any utility anywhere."

Adds Tim Gibson: "The truth of the matter is that customers already have a lot of options with devices they can buy if

they want to reduce their bills and become more energy efficient. But with the plan NB Power is putting forward, consumers are now able to get that technology from a trusted utility. They don't have to go find a third-party contractor or a company they're not sure they can depend on. This is a solid option from a trusted crown corporation."

Pierre Mullin, Vice President of Emerging Products and Smart Grid Applications for Siemens, who is based in New Brunswick, adds that sophisticated analytics is an important innovation engine making it all possible.

"We need to constantly forecast supply and demand at very narrow time intervals, and analytics give you the foundation for that," he says. "On top of that, at home you might use a thermostat control or a hot water heater for energy shifting on one day, and on the next day use it for power quality, and on another day you might be bidding on the energy markets. Much of this is driven by big data. In the past, where you might have had a dozen generating stations feeding data, now you've got potentially hundreds of thousands of homes doing the same thing and you need to be able work with all of that."

### More reliable electricity for consumers

In addition to that demand side of the equation, NB Power is also starting to utilize ILM to drive operations improvement on the distribution system – from poles to wires to substations. It means more reliable service, with fewer and shorter outages, and the ability to manage the introduction of new societal paradigms, such as the introduction of electric vehicles on a mass scale.

"I think the focus on reliable provision of electrical service is only going to increase in the future," explains Wasson. "It's just the way we live as a society. Our expectation is that we'll have constant communications through all our phones and computers and other devices. All of those technologies are dependent on the electrical system, so people's tolerance for any downtime is getting lower and lower, and the pres-



sure on the utility to increase reliability is constantly going up.”

In the face of unpredictable weather conditions, and an unavoidably aging infrastructure, Siemens ingenuity will also assist NB Power with new ideas on the reliability front, such as energy storage devices and new, smaller-scale sources of generation.

“We have an ability to exceed customers’ expectations in reliability because we are implementing this smart grid technology,” says Wasson.

As Mullin describes it: “The high-voltage grid traditionally has had lots of sensors and systems to track availability. But that hasn’t been true on the distribution grid. Now we can provide much more awareness of what’s going on in the distribution grid, so we can react to problems quicker, but also with analytics, actually detect them before they happen and proactively solve them. It means we’re not only using all of this connectivity to optimize the energy system, but also to analyze and predict faults and trouble areas.”

For example, he notes, the utility could foresee abnormal voltage issues on a particular feeder.

“And that could raise an alarm,” explains Mullin. “Then someone could look at what the root causes of that might be, and we could have things like smart transformers so we can detect that they’re overheating and then do

the maintenance proactively. Right now, transformers are always replaced when they die. They’re almost never preventatively replaced.”

That kind of work also means laying the foundation toward a future of renewable energy, which is yet another way NB Power’s transformation resonates with today’s consumers, who are motivated to reduce their impact on the environment in whatever way they can. This includes embracing a new idea like solar power, which is quickly gaining traction in the province, or shifting their energy away from peak hours, where “peak plants” generally run by oil – a very expensive and greenhouse-gas-emitting fuel – need to be used to top up the generation that’s needed.

“With the system NB Power is putting in place, they’ll be able to look at centralized generation of hydro, coal, gas, biomass and oil, while also looking at the renewable sources of wind and solar,” says Gibson. “They’ll be able to optimize the mix between renewable and non-renewable, ensuring that the maximum of wind and solar can be used, with the minimum burning of fossil fuels.”

#### Compass methodology from Siemens charts path toward the future

The power of innovation behind everything Siemens and NB Power are doing stems to a large extent from Compass – Siemens powerful consulting method-

ology that serves as a roadmap for taking a utility through a smart grid transition. In short, Compass enables a smart grid initiative to be fully architected. That includes not only the technologies that are needed, but also the process and organizational changes that are required.

According to Brad Wasson, it has been used to the max at NB Power.

“We really like that the Compass methodology brings together the need to transform the utility through business process innovation, in addition to introducing new technology,” he says.

“The Compass methodology is literally a business process transformation methodology. It actually begins with an analysis of what business processes are we using to run the utility.”

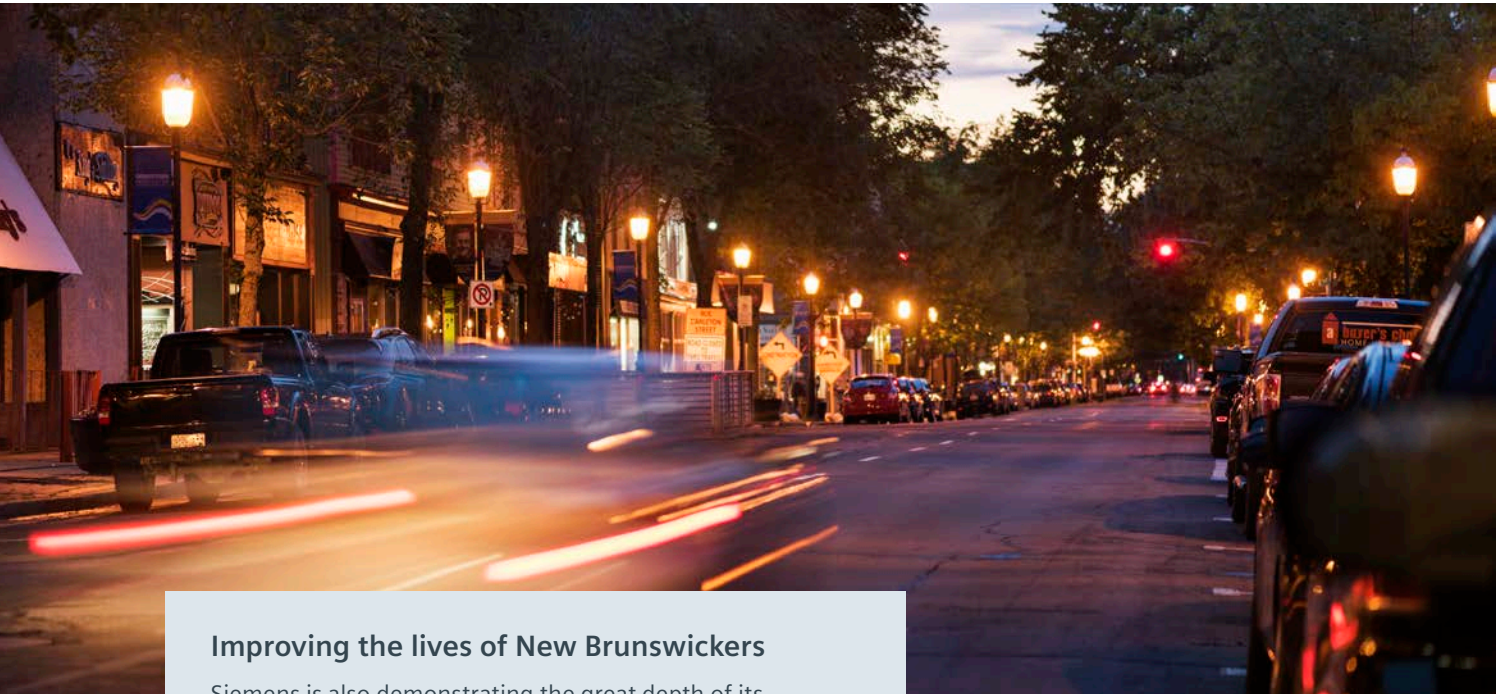
Tim Gibson notes that the rigour of Compass is a key defining element of the methodology.

“There’s a part of Compass called value management,” he explains. “Every one of the initiatives we do within the program is predictive, in improving a key performance indicator, such as saving money or shortening an outage window. We baseline all those indicators before we start to implement anything, to ensure that when we change things, it’s actually delivering the improvements NB Power is looking for.”

Transformational work guided by Compass spans five key areas: Network Operations, Customer Participation, Asset and Workforce Management, Smart Energy, and Smart Organization.

“The Compass methodology incorporates the ability to do a refreshed look at the logic that underpins the program. We’ve taken advantage of that to reassess,” notes Wasson. “And sure enough, one of the outcomes was that we learned we needed to do additional work in the area of customer-facing smart products and services, which now represents a ring around those five main areas. Kudos to Siemens because that ability to re-assess, adjust and adapt was incorporated into the plan right from the beginning.”





### Improving the lives of New Brunswickers

Siemens is also demonstrating the great depth of its commitment to improve the lives of New Brunswickers with three special ingenuity-driven investments. First, the Global Centre of Competence in Fredericton leverages the delivery of Siemens end-to-end smart grid solution for NB Power. Second, a related Research and Development office manages the design and rollout of smart grid software. And finally, support for smart grid research projects is undertaken at universities in New Brunswick, including the Department of Electrical and Computer Engineering at the University of New Brunswick (UNB), which is located in Fredericton.

From NB Power's perspective, that commitment by Siemens to innovation in the province – to help grow smart grid as a global trend – is extremely beneficial.

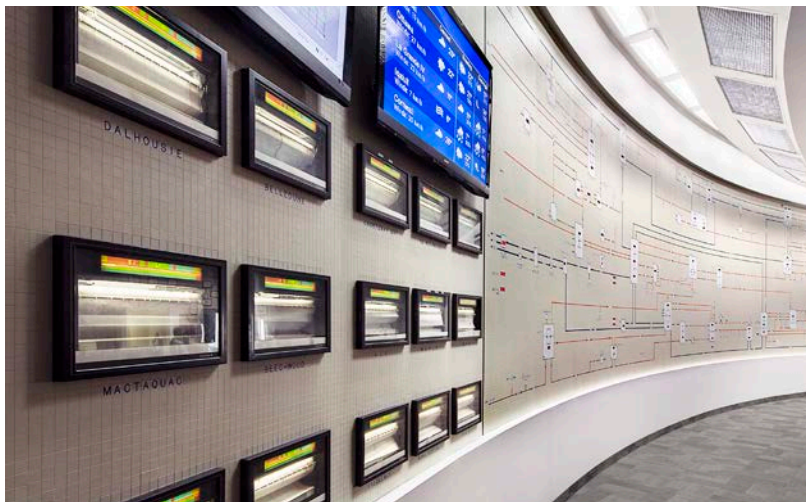
"We're a direct recipient of all that world-class technology development, especially when it comes to ILM," notes Wasson.

### Smart Grid Innovation Network

Most recently, an agreement between Siemens, NB Power and UNB has created a "Smart Grid Innovation Network" (SGIN), which links three separate labs, each based on helping meet challenges specific to the different lifecycle stages through which an innovative smart grid idea progresses, from initial concept to fully-fledged product offered in marketplace.

Specifically, determining if an idea has scientific merit is the key hurdle early in the process. For that, a pure research lab at UNB was established for testing and validation. The second-stage lab at Siemens is focused on interoperability, and ensuring the product can connect to a utility's power grid. Assistance for that comes mostly in the form of software development. The lab for the third and final stage is at NB Power, where products that are close to being commercially ready are tested for practicality. For example, the lab assesses how easily a device can be installed in a house, with tweaks made to ensure it's truly market-ready.

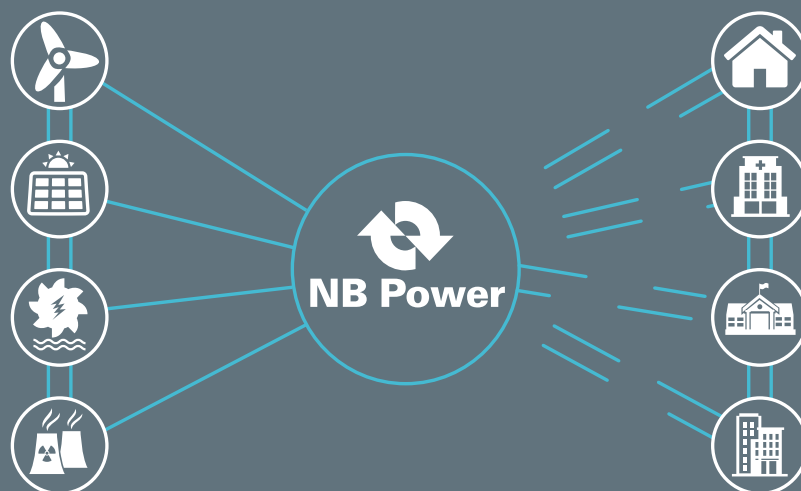
"This is reaching out to the innovation community in New Brunswick and saying: 'If you have a smart-grid-related product and you want to move it all the way to market availability, we're here to help,'" explains Wasson. "It demonstrates just how strong Siemens is committed to ingenuity in this province."





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Tim Gibson, Vice President of Smart Grid,  
Siemens Canada



As Pierre Mullin notes, the benefits may be discovered in New Brunswick, but will be felt globally.

"This will help utilities everywhere transition to a future that based on green, renewable energy. They all come with challenges because they are variable. For example, if the wind drops or the sun is blocked you no longer get the energy, so ingenuity is needed on energy storage and controllable loads. Solutions like that represent a major focal point at Siemens. The SGIN is a great opportunity to accelerate that progress and get a lot of other innovative people involved."

He also feels it's a vehicle towards helping develop the workforce of the future.

"A great example is a technician who would work on heating and cooling systems," he describes. "If that becomes part of a smart building and is connected to the grid, all of a sudden that technician now needs to have a lot of knowledge of Internet connections and protocols and local area networks. The solution delivered is as much information technology as it is mechanical technology. So that requires a new kind of workforce, and a new curriculum to develop these technicians of the future. So we're working with the universities and the colleges to help develop the profile of what this workforce of the future looks like, and also to help ramp up the existing workforce."

#### Commitment to powerful innovation: Siemens as a trusted partner to NB Power

A successful smart grid transformation ultimately comes down to one key factor – a remarkable partnership between Siemens and NB Power.

"No utility has gone this far with a vision this significant, this broad. I don't think there's any consultancy out there like Siemens with their industry-leading Compass methodology that could take a utility as far as we're planning to go," notes Wasson. "We know in our heart of hearts that our vision for the modernization of our utility is the most comprehensive in the world, and by extension, Siemens as our coach is a pioneer right there with us."

Success, he adds, comes down to the people involved – with Siemens smart grid and Compass experts from around the world dedicated to the success of NB Power.

"All these people are made available to us, basically at a moment's notice, just by picking up the phone," Wasson explains. "And Siemens is such a powerful entity, with all that worldwide experience, and we are able to tap into it in so many different ways to enable our transformation."

The collaboration between the two sides is best exemplified by Siemens and NB Power employees coming together as a roughly 60-member team co-locating together at NB Power headquarters.

"It creates a much deeper understanding on both sides," says Gibson.

"For us, it means we can live and breathe our customer's needs and challenges, and get their industry insights. And on the flip side, it allows us to convey our knowledge of global trends, technology, and business models from elsewhere."

Says Wasson: "When we say co-located, we mean that if you walk into a work area, you'll find cubicles that are a mixture of Siemens and NB Power people sitting side by side. You would not even know who is from which company. We have found the synergies we want are strongest when you sit side-by-side, with lots of open meeting space for collaboration, with everyone working toward the same vision and goals that are so ambitious. It's leading-edge and it's exciting."

Wasson adds there is not the slightest regret in choosing this path of transformation, made possible by NB Power leveraging the powerful innovation of Siemens.

"Siemens ingenuity is the secret sauce that's going to allow our utility to be successful in the future," he says. "I'm hoping we can speed things up even more in the future because the world's changing faster than we originally expected. Thank goodness we have made so much progress and have such a great foundation in place."