Énergie NB Power

Association of Professional Engineers and Geoscientists of New Brunswick

Solar Panel Net Metering Case Study

Purpose

The Association of Professional Engineers and Geoscientists of New Brunswick (APEGNB) have connected their head office, located at 183 Hanwell Road in Fredericton to the New Brunswick energy grid, through NB Power's Net Metering Program. The journey to participate in the net metering program began in the summer of 2014, when the Association's Council members were inspired to explore renewable energy generation options after hearing a presentation by NB Power executives.

The members of the Association heard NB Power President and CEO, Gaëtan Thomas, speak about the future of NB Power, energy in New Brunswick and trends in the electric utility business. Mr. Thomas spoke about a future that embraces renewables, smart grids, smart user systems, distributed generation and net metering. These - and other methods - will help to reduce peak demand and provide more security and flexibility in the province's electric utility business.

Motivated by this message, and recognizing the societal need to mitigate climate change and inspire confidence in renewable energy, the Association decided to take a 'lead by example' approach. As a regulatory body ensuring only qualified and licensed professionals practice engineering and geoscience in the province, it was important to their members that the Association provide social leadership as an early adopter of renewable energy.

After exploring a number of renewable energy options, the Association's members decided to install solar panels and participate in the net metering program. Within a few months, the plan to install sixty 250 Watt solar panels was in place. By late June of 2015, the panels were capturing the power of the sun and converting into energy for use at the Association's office or, when not needed at the office, putting energy on the NB Power grid for other New Brunswick customers.

Building

Built in 2007, the APEGNB office is a relatively new 446 square metre commercial building that serves as the main office for APEGNB. Primarily used during the work week from 8:30 am to 4:30 pm, the building is made up of a number of offices, a lunch room, conference rooms, washrooms, a copy room, and mechanical and electrical rooms.

In order to identify areas to improve the building's energy efficiency, before the installation of the solar panels, the APEGNB office underwent an energy audit. Thanks to a high-performing building envelope and two high-efficiency air source heat pumps, the energy evaluation revealed the overall energy use of the office building was low in comparison to similar facilities.

The audit report recommended the installation of programmable thermostats, LED light fixtures, water-efficient faucets and solar panels. Adding a renewable energy source to the building was the natural next step to reducing greenhouse gas emissions and energy costs associated with the APEGNB building.

The energy audit also modeled the building using a renewable energy modelling software produced by Natural Resources Canada called RetScreen (http://www.retscreen.net). This software is used around the world to model energy efficient retrofits and energy projects, to determine technical and financial viability of potential renewable energy, energy efficiency and cogeneration projects.

Technologies

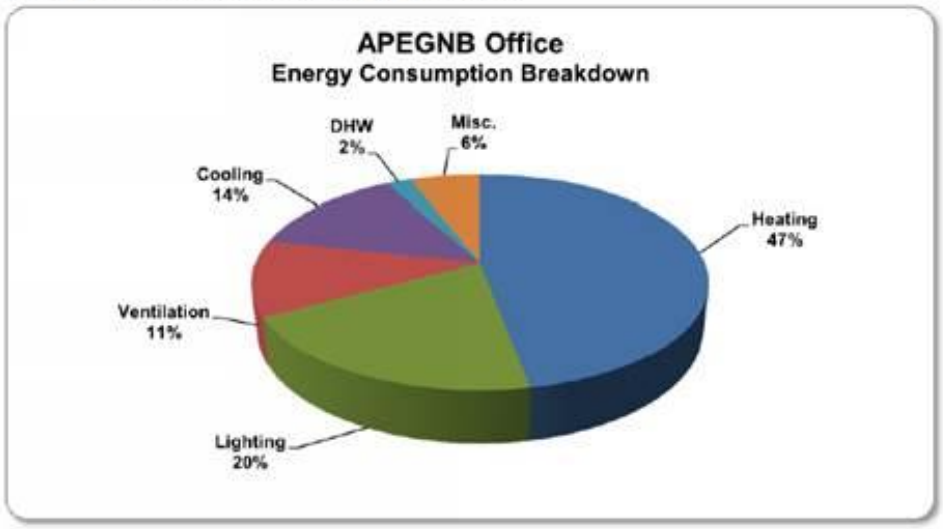
For APEGNB, choosing solar as the renewable energy source was a fairly easy decision. The building's east/west orientation and the roof's north/south angles made solar panels a natural fit. Sixty 'Jinko' 250-Watt solar modules are installed, set up in three sets of 20 parallel panels and generate a total capacity of 15 kiloWatts. The solar system uses micro inverters instead of the more commonly installed central inverter. One central inverter would normally cover an

entire array, whereas micro inverters sit on the back of each and every solar panel. Micro inverters optimize every solar panel in the array, while a central inverter optimizes the array only. This allows every solar panel to operate at maximum potential, unlike a central inverter where one solar panel can potentially decrease the performance of the entire array. This seemingly small optimization of the micro inverters can add up to large savings over the life span of the panels.

Energy Production

The total energy production of the solar panels at the APEGNB site is anticipated to be 18,000-19,000 kWh per year. With an annual average energy use of 52,000 Kwh per year, the new solar installation will meet approximately 35% of the electricity needs of the APEGNB building.

Figure 4.3.1 – Electrical Consumption Breakdown



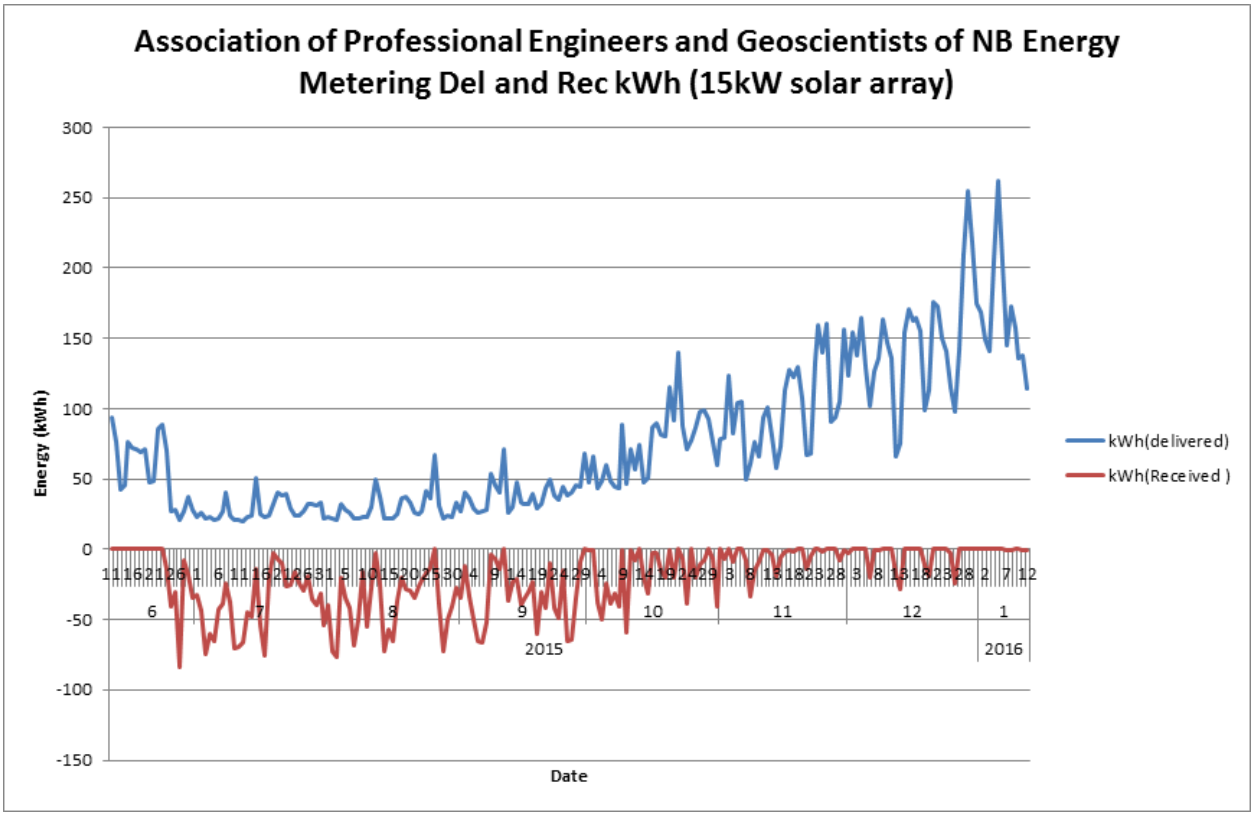
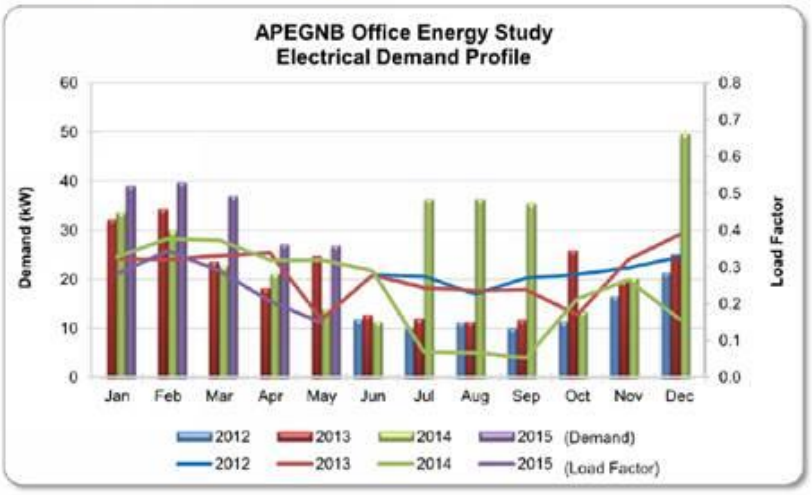


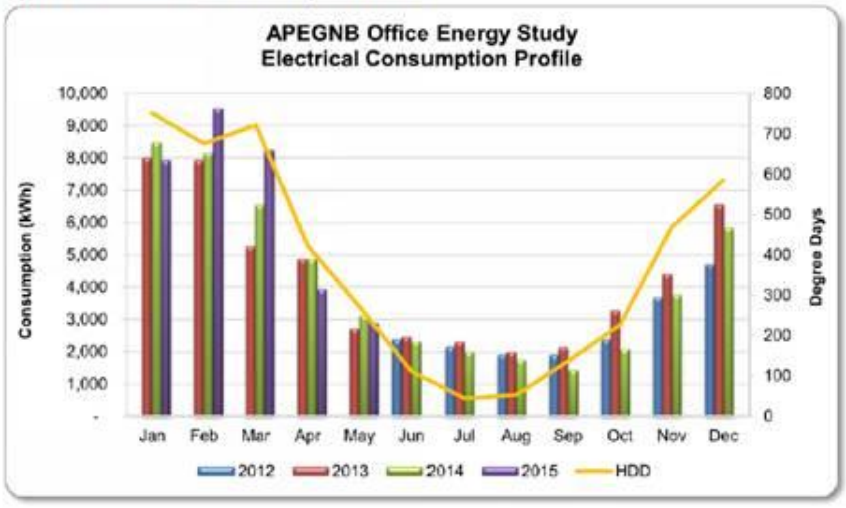
Figure 4.1.2 – Electrical Demand Profile



The demand profile above shows a correlation between the electrical demand and the heating requirement of the facility. Note that a peak in electrical demand was experienced in 2014 during the months of the summer and again in December of that same year. The peak amount appears to be consistent at approximately 25 kW however; it is currently unknown as to what triggered these peaks. As shown in the previous figure, while the electrical demand peak was significantly more in these months than any other months of the year, the energy consumption during these months did not increase significantly suggesting that the event triggering the demand peak was brief and not sustained.

The following figures illustrate the monthly profiles for the representative utility usages. The yearly profiles and monthly consumption summary are found in ***Appendix B – Energy Utility Data.***

Figure 4.1.1 – Electrical Consumption Profile



The graph above shows a direct correlation between the electrical consumption and the heating degree-days for the facility. As such, the facility's energy consumption is primarily utilized for heating with a small base load representing lighting and domestic hot water heating energy. The energy consumption above the heating degree-days line shown in the summer months contributes the cooling energy of the facility during those months.

Lessons Learned

APEGNB approached this project by assessing and measuring the perceived value it would represent to the Association's members and the public, weighing social, financial, and environmental benefits.

The Association, representing engineers and geoscientists who are the professionals responsible for designing and ensuring a reliable and diversified energy infrastructure in New Brunswick, wanted to use their central office to likewise lead by example and generate clean, renewable energy on-site for their facility. Similarly, APEGNB ensured their building's energy efficiency was up to par with an energy audit in order to identify upgrades that would lower their baseline energy consumption.

"We are the people at the forefront of new technology—from its development to its implementation," said past president Paul Campbell, PEng "Recent advances in solar energy and electric utility management have made active solar power a cost-effective investment for property owners. The time was right for us, as New Brunswick's technology innovators, to show community leadership in the fight to mitigate climate change and become an early adopter of renewable energy."

Mr. Campbell emphasized the success already realized through the awareness raised among the public. "Another indication of the success of our solar array is the impact it has had in our community. Many people and environmental groups have applauded our leadership in helping to mitigate climate change."

"We can say that on the sunniest days, our solar array generates well over 100 kilowatt-hours of energy during a 24-hour period. Having the largest solar array in New Brunswick has certainly raised the profile of engineering and geoscience," he added.

Members of the public can see for themselves how much energy APEGNB's solar panels generate each day by visiting www.apegnb.com.

For More Information

NB Power's net metering program allows customers to generate electricity while still remaining connected to the grid and have their electricity demands met when their own energy source cannot. A net meter monitors the customer's electricity consumption from NB Power and the excess electricity the customer sends back to the grid. Customers are billed for the difference or 'net' amount of electricity used.

As of January 2016, there are 52 net metering customers tied in to NB Power's grid, with 232 kW of solar and 47 kW of wind energy being produced. Net metered homes and businesses are a win-win-win; they enable customers to reduce their electricity bills while shrinking their environmental footprint, reducing peak demand for the utility, and reducing greenhouse gas emissions.

Contact NB Power at 1 -800 -663-6272 or visit www.nbpower.com to learn more about net metering, energy efficiency and energy conservation. We are happy to help our customers learn about this renewable energy option and we will provide you with up-to-date information to help you make the best decisions possible.