CASE STUDY

TOWN OF RAYMOND

September 2019

Since 2009, the Municipal Climate Change Action Centre has empowered Alberta's municipalities, school authorities and community related organizations to be leaders in climate change solutions through partnerships and innovation.This case study highlights how Town of Raymond participated in the Alberta Municipal Solar Progam.

Municipal
Climate Change
Action Centre

The Municipal Climate Change Action Centre provides funding, technical assistance, and education to support Alberta municipalities, schools, and community related organizations in addressing climate change.

The Municipal Climate Change Action Centre is a partnership between the Alberta Urban Municipalities Association, Rural Municipalities of Alberta and the Government of Alberta.

Special thanks to the participant

The Town of Raymond is home to Canada's first rodeo, the first electrically net zero municipality in Alberta and, is a municipal leader in Alberta's energy transition.

Statistics for projects completed through the Alberta Municipal Solar Program.

2,983
SOLAR PV MODULES INSTALLED IN 2019

9
MUNICIPAL SOLAR SITES COMPLETED

1st
ELECTRICALLY NET ZERO MUNICIPALITY IN ALBERTA

EMISSIONS REDUCTIONS ARE EQUIVALENT TO TAKING

177 CARS
OFF THE ROAD EACH YEAR

100%
OF TOWN'S ELECTRICITY USE IS SOLAR PV

16 YEARS
SIMPLE PAYBACK

239,433 kWh
SOLAR ELECTRICITY PRODUCED PER YEAR

1,302 MWh
SOLAR ELECTRICITY PRODUCED EACH YEAR

$643,481
IN REBATES FROM THE ACTION CENTRE

REAL SAVINGS. REAL CHANGE.

Located 35 km south-east of Lethbridge, and home to 4,252 residents, the Town of Raymond is primarily an agricultural town with strong Japanese and Mormon community roots.

It also has some of the best solar resource in the province, if not the country, with an average annual solar irradiance of 4.85 kWh/m^2, when facing south with a tilt angle of 34° C. This translates into a potential energy production from solar photovoltaics (PV) of 1,328 kWh/kW of installed panels (Natural Resources Canada, 2017).

Kurtis Pratt, Raymond's Chief Administrative Officer (CAO), and council are continually looking for ways to make Raymond stand out as an innovative community leader. Combined with concerns about the forecasted market increase in electricity prices, generating their own renewable electricity seemed like the perfect way to show leadership in environmental protection while also buffering the town from rising energy costs.

When council learned about rebates available through the Alberta Municipal Solar Program in 2018, they decided to install nine solar PV arrays on municipal facilities and land, accessing $643,481 in funding from the Municipal Climate Change Action Centre (Action Centre). Before rebates, the system cost was $2,781,923. The 2,983 modules installed have a total capacity of 1.16 Megawatts and are expected to produce 1,302 MWh of electricity per year. This will offset 100% of Raymond's operations' annual electricity use and provide an estimated annual savings of $130,186.

Victoria Athletic Carport, Town of Raymond

SOLAR PV SYSTEMS

Raymond worked with their solar contractor on all nine systems coordinating projects with a variety of ground and roof surfaces, tilt angles, and azimuths, as seen in Table 1.

The solar contractor visited all the municipally-owned facilities and recommended the sites best suited to solar installations. The system components were selected, and each system was optimized to produce the most electricity within the parameters of the specific array locations. LG NeON®2 modules were used in all nine arrays with either SolarEdge or Fronius grid-connected three-phase string inverters. SolarEdge DC optimizers were used in many of the roof mounted systems to reduce the impacts of shading, from clouds or nearby obstructions, and optimize overall system production. RoofTech mounting brackets and Kinetic rails were used for the flush-mount roof installations. Polar PRU-D racking and helical piles were used for the wastewater treatment plant ground-mount system. A SunAction racking and mounting system was used for the Athletic Park Carport, and Polar PRG racking systems were used for the ballasted flat-roof systems.

Location	Array Capacity	Mounting Type	Modules	Inverters	Optimizers	Racking	Tilt Angle	Azimuth
Aquatic Centre	42.92 kW	Flat Roof Ballasted	116 - 370W LG NeON®2	2 - 20 kW Solar Edge	58 - P800 Solar Edge	Polar PRG ballasted racking system	10°	224° (SW)
Fire Hall	17.02 kW	Roof Flush Mount	46 - 370W LG NeON®2	1 - 14.4 kW Solar Edge	23 - P800 Solar Edge	RoofTech mounting brackets & Kinetic rails	18°	90° (E)
Arena	246.05 kW	Roof Flush Mount	665 - 370W LG NeON®2	6 - 33.3 kW Solar Edge	334 - P800 Solar Edge	RoofTech mounting brackets & Kinetic rails	15°	90° (E) & 270° (W)
Town Hall	43.2 kW	Flat Roof Ballasted	108 - 400W LG NeON®2	1 - 33.3 kW Solar Edge	54 - P800 Solar Edge	Polar PRG ballasted racking system	10°	181° (S)
Golf Course	41.2 kW	Roof Flush Mount	103 - 400W LG NeON®2	4 - 10kW Solar Edge	103 - P505 Solar Edge	RoofTech mounting brackets & Kinetic rails	18°	202° (SSW), 90° (E) & 270° (W)
Wastewater Treatment Facility	288 kW	Ground Mount	720 - 400W LG NeON®2	9 - Fronius Symo 24 Lite 1 - Fronius Symo 24 Adv.	n/a	Polar PRU-D racking & helical piles	30°	180° (S)
Town Shop	29.97 kW	Roof Flush Mount	81 - 70W LG NeON®2	1 - 20 kW Solar Edge	41 - P800 Solar Edge	RoofTech mounting brackets & Kinetic rails	5°	180° (S)
Athletic Park Building	64 kW	Roof Flush Mount	160 - 400W LG NeON®2	1 - 33.3 kW Solar Edge 1 - 20 kW Solar Edge	80 - P800 Solar Edge	RoofTech mounting brackets & Kinetic rails	5°	90° (E)
Athletic Park Car Port	383.76 kW	Ground Mount	984 - 390W LG NeON®2 Bifacial	14 - 24.0-3 Fronius Symo	n/a	SunAction racking & mounting system - double wing	10°	90° (E), & 270° (W)

Table 1. Solar PV Installation details for Raymond, Alberta

Ridgewater Treatment Plant

Golf Course Club House

Victoria Athletic Park

Victoria Athletic Park Carport

Golf Course Maintenance Building

Fire Hall

Town Hall

Raymond Public Works Shop

Raymond Arena and Aquatic Centre

"This decision by council to become one of the first municipalities in Alberta to become electrically net-zero was made with the future in mind. It provides us budgetary certainty regardless of the geopolitical and market factors outside of our control and allows us to stretch our limited resources further than we could before."

Kurtis Pratt, Cheif Administrative Officer, Town of Raymond

The $643,481 in funding contributed by the Action Centre covered about 23% of the $2,781,923 total project expenses. The remaining expenses were covered through a 15-year financing agreement. With the financing option, the annual payments for the system are equal to the savings Raymond sees from their reduced electricity costs, making the systems cash-neutral for the financing term. The lifespan of the solar PV systems is also expected to be significantly longer than 15 years, so once the systems are paid off the annual electrical savings they produce will free up money Raymond can then direct towards other projects and services for residents.

An estimated electricity rate of $0.10/kWh was used in all savings and payback calculations for this case study. This rate is based on the historical average electricity rate in Alberta and factors in an estimated increase in electricity rates, averaging across a 25-year period. This rate is a conservative estimate and does not include any savings from reduced energy-related distribution and transmission charges when solar electricity is used onsite and not purchased from the grid. Using this rate and the estimated annual electricity production from the solar system it is estimated that project will produce a savings of $130,186 per year.

REAL SAVINGS

THE ECONOMICS

$130,186
ANNUAL ENERGY SAVINGS

16 YEARS
SIMPLE PAYBACK

$2,781,923
PROJECT COST

$643,481
IN FUNDING FROM THE ACTION CENTRE

"The estimated revenue we will generate from producing electricity should offset our lease payments so that there is no new net cost to the town."

Kurtis Pratt, Cheif Administrative Officer, Town of Raymond

The $0.10/kWh rate also does not factor in that some of Raymond's arrays will potentially receive larger credits due to their size. Within the Alberta Micro-generation Regulation there are two categories of micro-generation units, both with different ways of calculating how much the producer will be credited for the electricity their system puts back onto the grid.

Most of Raymond's arrays fit within the 'small micro-generator' category, which means that they are credited for electricity sent back to the grid on a monthly basis at their retail electricity rate. Three of the systems (the Arena, Wastewater Treatment Facility, and Athletic Park Car Port) are considered 'large micro-generators' (>150 kW) and the electricity they send back to the grid is credited at the Alberta Power Pool hourly rate, corresponding with the time that the electricity is put onto the grid.

For solar, this often results in larger systems receiving a potentially higher credit rate than smaller systems as they are producing the most excess electricity at times when the pool price is typically higher. To provide some context around pool price fluctuations, Figure one shows the Alberta average pool price per month over a five-year period from January 2014 through October 2018 (Alberta Electric Systems Operator, 2018). One of the most common questions asked when assessing whether a project is worth pursuing or not is "how long will it take for it to pay back?" This calculation is called the simple payback, or in other words the length of time it will take before the money seen from energy savings will equal the amount that was paid for the system in the first place. To calculate this number, the total system costs are divided by the estimated total energy savings per year. When factoring in the Action Centre rebate, Raymond's systems will see a simple payback of just under 16 years, which is five years shorter than without the rebate.

As all nine systems have not yet been online for a full year, there is not enough data available to calculate the annual energy they have produced or the actual savings Raymond has seen from the operational project. Raymond's CAO reports that the systems appear to be producing as expected. The Action Centre will continue to monitor their progress and aim to provide an update to this case study with real values on system operations and savings in the years to come.

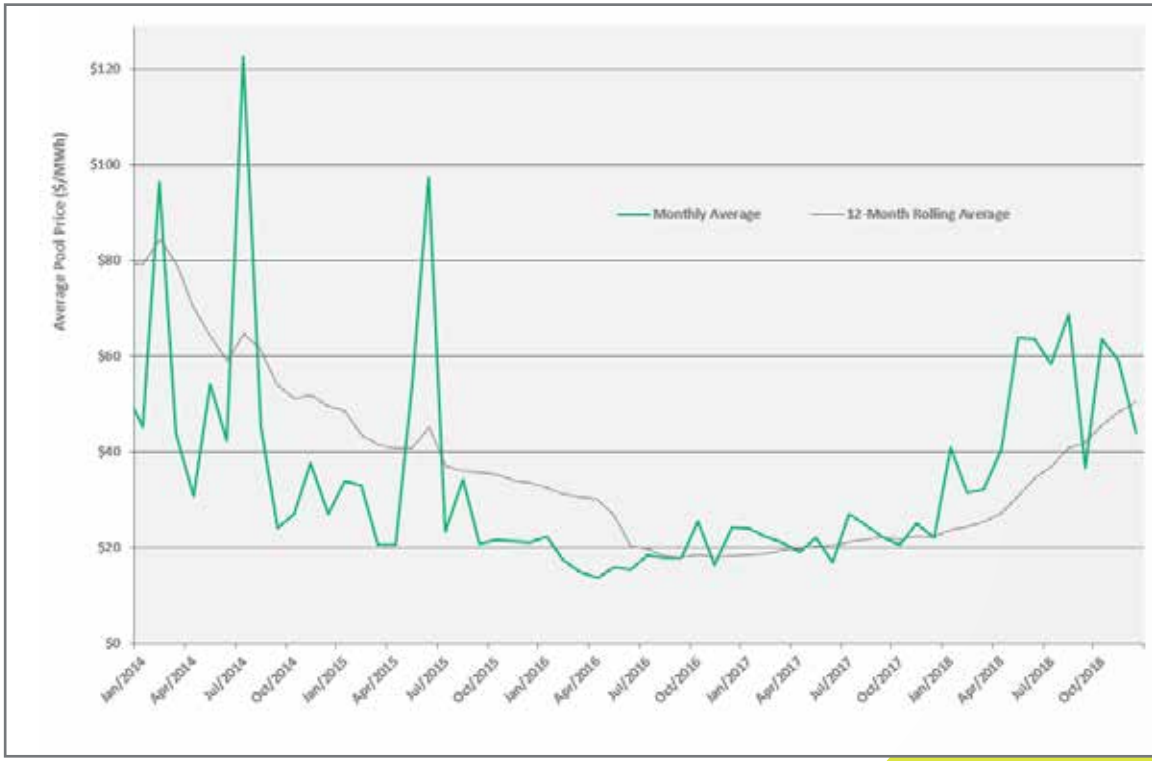

Figure 1. Alberta Electric Systems Operator monthly average electrical pool price over five years (Alberta Electric Systems Operator, 2019).

Combined, the nine systems are expected to produce 1,302 MWh of electricity per year, which will offset 100% of the electricity used by Town of Raymond's operations.

This includes electricity for the facilities hosting solar PV systems in addition to Raymond's streetlights, Community Centre, the Family and Community and Support Services Building, Museum, RCMP detachment, Seniors Centre, Agricultural Society, and the Municipal Park and Campground. All solar electricity produced will be prioritized for use by Raymond's operations first. Excess power will be put onto to the Alberta electricity grid, with the town receiving a credit on their electrical bills for the exported amount. When electrical demand cannot be met by the solar PV systems (i.e. at night, during short winter days, or on a cloudy or stormy day), electricity from the grid will be imported and charged to Raymond's electricity bill as usual. Raymond will typically export excess solar electricity in the summer months and import grid electricity in the winter months, making operations electrically net-zero over the course of a year.

As of March 2019, electricity available from Alberta's grid was generated by coal-fired power plants (36%), natural gas co-generation, combined and simple cycle power plants (48%), wind turbine power generators (9%), hydroelectric facilities (5%), and other sources (3%) (Alberta Electric Systems Operator, 2019). The heavy reliance on combusting fossil fuels to generate electricity makes the Alberta grid one of the most emissions-intense electricity grids in Canada. By committing to replace 100% of the electricity they use with a renewable generation source, Raymond will avoid producing the equivalent of 833 tonnes of CO_2 per year. This calculates to a greenhouse gas (GHG) emissions reduction of 20,830 tonnes over the course of the systems' minimum 25-year expected lifetime. For each year the system is operating, it is equivalent to taking 177 cars off the road. (US Environmental Protection Agency, n.d.).

REAL CHANGE
ENERGY AND EMISSIONS

100%
OF ELECTRICTY IS GENERATED FROM RENEWABLE RESOURCES

20,830 TONNES
OF GREENHOUSE GAS EMISSIONS REDUCED OVER 25 YEARS

1,302 MWh
OF ELECTRICITY GENERATED PER YEAR

Much of the initial work putting the project proposal together was done by Raymond's CAO working closely with the solar contractor, who provided the technical, system, energy, and payback information, in addition to assisting with the presentation to council.

Raymond's councillors were open to the idea from the beginning and recognized that installing solar systems on Raymond's facilities to offset operational consumption was the right choice for Raymond.

The time elapsed from council hearing of the project and the rebates available from the Action Centre to the final system being completed and energized was 16 months. Within this timeframe, Raymond invested about 100 hours of staff time on the project.

This time was spread across the entire project timeline and was typically no more than an hour here or there for meetings and consultation with the solar contractor. The solar contractor carried out the bulk of the project management, system design, construction, and commissioning of the project. Raymond staff have also spent very little time on maintenance or operational duties related to the system in the first year of operation.

This is expected to be the case for the duration of the systems' lifetime as solar PV arrays are relatively maintenance free. Most solar PV systems recommend a basic visual and system performance inspection once per year, including cleaning the modules with water if they are dusty or dirty.

PROCESS

IMPLEMENTATION AND OPERATION

"Partnering with the MCCAC and the solar contractor has been a positive experience for our community. Both organizations were extremely professional and worked collaboratively to reduce the amount of time and staff resources we had to give to complete the project."

Kurtis Pratt, Cheif Administrative Officer, Town of Raymond

100
HOURS OF STAFF TIME PUT TOWARDS THE PROJECT

MINIMAL TO MAINTENANCE FREE

16
MONTHS TO COMPLETE FROM APPLICATION TO INSTALLATION

The staff from Raymond involved in the projects have stated that overall the projects have been viewed as a success. The systems are up and running and the overall response from residents has been very positive.

There is a real sense of pride in the systems and for the leadership and vision that Raymond has shown in reducing their environmental impact and planning for the future.

The solar contractor assisted in preparing the initial proposal and presentation to council and took care of the majority of the project management work during the installation and commissioning phases, requiring very little involvement from municipal staff. Aside from a few initial meetings and occasional project check-ins, the process was described as 'painless'.

As for lessons learned, Raymond staff indicated that if they had known what they know now at the beginning, they would have chosen to move forward with a full net zero project from the start, to save time.

Their initial intention was to offset as much electricity consumption as possible and after the first phase was complete they decided to implement more projects with the aim of being fully electrically net zero; a choice that they do not regret. According to Raymond, the multi-phase process added unnecessary time.

PROCESS
LESSONS LEARNED

"After the 15-year lease payments are complete, it is estimated that we will have approximately $150,000/year in annual energy savings for at least the next 15 to 25 years. This 'new money' will give us increased flexibility in our annual operating budget and provide us with cost certainty for decades to come."

Kurtis Pratt, Cheif Administrative Officer, Town of Raymond

RESIDENTS
HAVE GIVEN POSITIVE FEEDBACK ABOUT THE SOLAR PV SYSTEMS

INCREASED
FLEXIBILITY IN ANNUAL OPERATING BUDGET

STAFF
SEE THE PROJECT AS A SUCCESS

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Victoria Athletic Park Carport

VISIT THE LEARNING CENTRE

A one-stop-hub of information, resources, and data to help Alberta municipalities and schools start climate change mitigation and adaptation. Access information on energy efficiency, renewable energy, community generation and more at mccac.ca.

Solar Friendly Municipalities Toolkit

The Toolkit provides municipalities with information to install solar on their facilities, reduce permitting and tax barriers in their communities, and engage on the benefits of producing power locally.

View

Municipal Climate Action Landscape

The Municipal Climate Action Landscape helps Alberta municipalities locate relevant climate change mitigation and adaptation resources.

View

Electric Vehicle Knowledge Guide

Learn more about best practices for deploying electric vehicles, and the various vehicle types available for rebates with this guide.

View

Alberta Solar Calculator

This calculator helps project planners evaluate the cost implications of proposed grid-connected solar PV projects when compared to purchasing electricity.

View

Alberta Funding Guide

This guide provides information about funding programs for renewable energy and energy efficiency projects available to municipalities in Alberta.

View

Electric Vehicle Calculator

This calculator helps project planners evaluate the cost implications of proposed electric vehicle purchases when compared to purchasing internal combustion engine vehicles.

View

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