John Paul II Catholic Secondary School

The Path to Becoming Canada's First Carbon Neutral School Retrofit

Funding Assisted by:

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Presentation Agenda

Project Overview & Goals

Key Project Technologies

Looking Forward - JP II Success

Project Overview & Goals

John Paul II Catholic Secondary School

- Often referred to as JPII
- Secondary school in London, Ontario
- Built in 1991
- Hosts about 900 students

JP II Project – The “why” of the project

Community 

- Provide a community emergency shelter when required given its self-sustaining energy characteristics
- Demonstrate social responsibility leadership to the City of London and to school boards and other facilities across Canada

School 

- Stabilize energy costs and avoidance of carbon tax costs over the long term through fuel switching from gas to all-electric
- Inspire the school’s student population and future workforce that these types of zero carbon projects are possible

Industry 

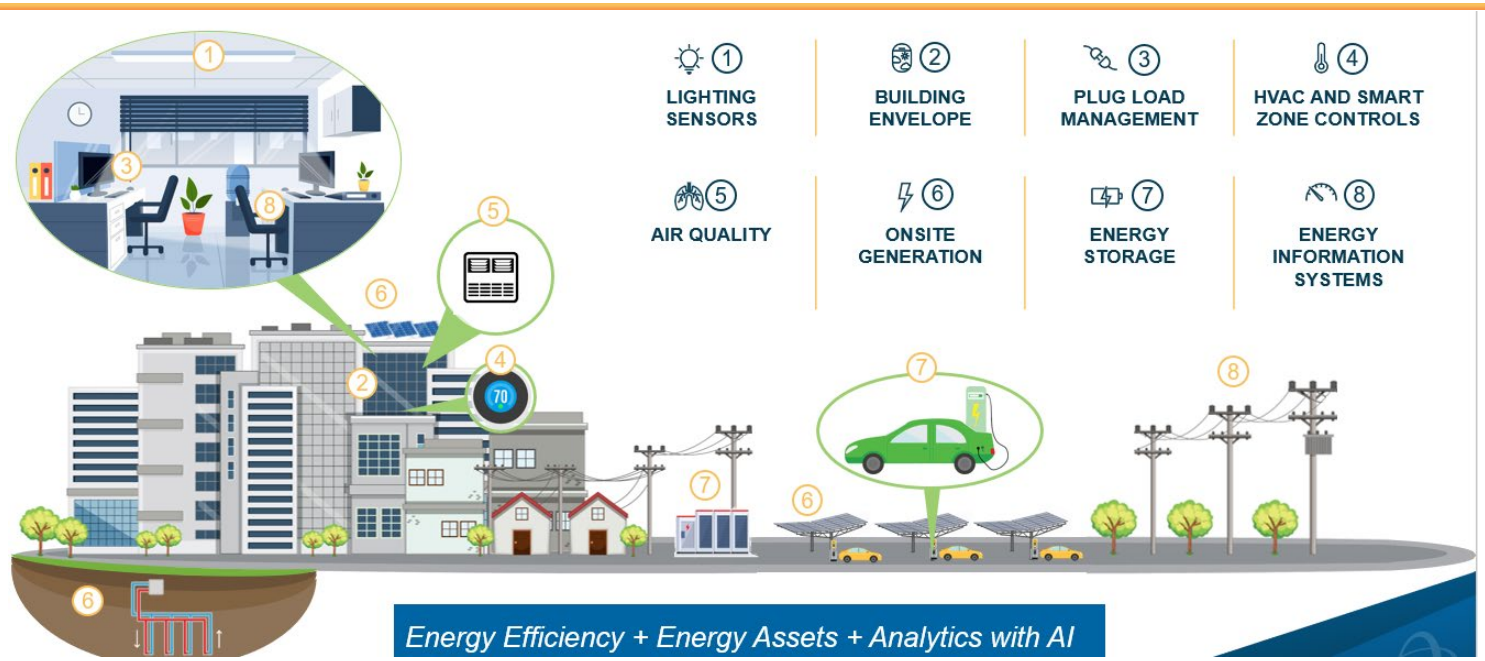
- Demonstrate approach to upgrade the facility with new equipment with no capital requirements from the facility owner through EaaS model.
- Learn what the opportunities might be with future revenue streams for property owners through energy market participation

The JP II Project – Why Ameresco & LDCSB joined forces

- Ameresco brought the idea and concept to LDCSB, made possible through Natural Resources Canada's Energy Innovation program that came available in 2017
- Ameresco had been a partner of the school board to reduce its energy costs and carbon footprint since1994 executing on 7 major projects, including some preliminary conservation work at JPII, with a value of over $50M
- Ameresco and LDCSB visions for a carbon future were aligned; the companies had a history of working together; LDCSB had confidence that Ameresco could deliver this project and it would be groundbreaking for both LDCSB's and Ameresco's demonstrated commitments to carbon reductions
- Ameresco assumed full responsibility de-risking the project for LDCSB both in terms of execution and capital financing

Why a Microgrid?

- Distributed Energy Resources (DER) and Systems introduce challenges to Local Distribution Companies (LDC)
- Owners of these DER systems should provide economical solutions to these challenges to ensure maximum deployment at lowest possible cost
- Microgrids provide this solution



- DER systems that are connected to distribution systems increase fault current potential due to their generation characteristics. Inverter based systems, including batteries, introduce less than that of rotating generators
- DER's in a microgrid configuration provide an opportunity for the LDC to instruct the DER operator to isolate from the grid when real time fault conditions approach existing breaker tolerances reducing upgrade costs while also providing the site with superior electrical quality and resiliency characteristics

The Importance of Energy-as-a-Service (EaaS)

- Investing scarce capital in projects that do not directly relate to a company's core business is difficult to justify in many cases
- Greater returns are usually achieved through investment in core activities
- Decarbonization is now a new challenge that all organizations need to find a way to implement even though, for most, it will not represent their core business
- The EaaS model helps to overcome this challenge by reducing or eliminating not only capital expenditures but the risks and responsibilities for managing the implementation and operation of new and more complex energy devices
- This project helped to develop how EaaS could help decarbonize existing school board building stock in Ontario by identifying those required project assets that should be included within the EaaS framework and which should remain with the ownership of the school board

The Art of the Possible: JP II Project Financing

2017 vision: JPII embedded energy microgrid system as a demonstration project

Study agreement between LDCSB and Ameresco (partially funded through in-kind contributions by Ameresco.)

2019 Front End Engineering Design (FEED) Study

Challenges for economics to work for either Ameresco or LDCSB without significant subsidies / grants

Natural Resources Canada grant application approved for 50% of project costs up to a max of CA$4.5M

The Art of the Possible: JP II Project Financing

With the NRCan grant approved in 2017, Ameresco was in the position to commit our equity to build own operate and maintain this demonstration project.

May 22, 2019 – Ameresco and London District Catholic School Board signed a 25 Year Energy as a Service Agreement.

May 2019 – May 2021 Canada's First Net Zero School Retrofit initiated and completed.

January 2020 – Project awarded $500K from Independent Electricity System Operator (IESO) Grid Innovation Fund to test technical capabilities of DERs for potential market participation.

EaaS

2021 - EaaS emerges as a much more common offering/solution in the market by energy solution providers. Guidehouse lists Ameresco as the leader in the field.

On May 1st, JPII Carbon Free Microgrid moves into commercial operation.

July 2021 - Selkirk Advisory group arranges financing for JPII, as well as for other Ameresco BESS projects to minimize transaction costs.

Key Project Technologies

“Inside Measures”

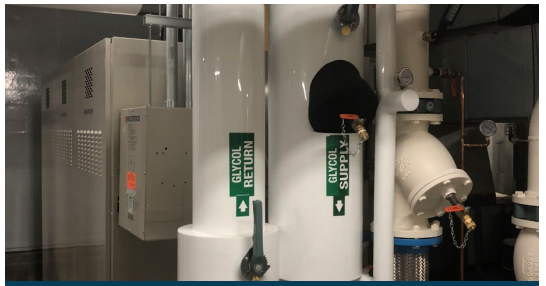
Existing Systems

- Traditional Water Source Heat Pump System
- High Efficiency Condensing Boilers for heat injection
- Closed Circuit Fluid Coolers for heat rejection
- Constant Speed Heat Pump Loop Pumps
- Gas-fired Air Handlers providing H&V to Tech Shops
- Legacy Building Automation System installed circa 2007

GHG Reduction Measures

- 250-ton Capacity Horizontal Geo-exchange Heat Pump System complete with variable speed pumping
- High Efficiency distributed heat pumps for classroom HVAC
- Cascaded Water-to-Water Heat Pump plants for low and high temperature systems
- Variable Speed Heat Pump Loop Pumps
- Rooftop Ground Source Heat Pump Units to provide HVAC to Tech Shops
- Niagara 4 BAS
- Circuit level submetering system
- AASG Analytic Planner

250-TON HORIZONTAL GXH SYSTEM

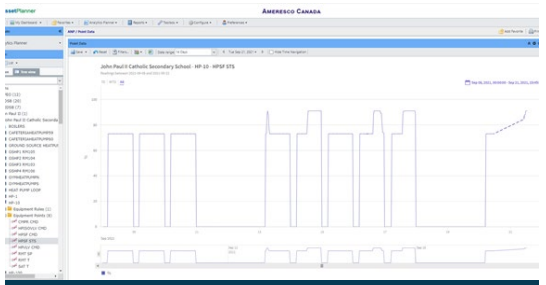


LOW TEMP HEAT PUMP PLANT

HIGH TEMP HEAT PUMP PLANT

VARIABLE SPEED PUMPING

RTU GSHP



ANALYTICS PLANNER

“Outside Measures”

Technology Features

- 625 kW carport AC solar
- 1,100 kW / 2,200 kWh Energy Storage System
- Large Scale UPS Microgrid configuration and protection
- SCADA system for real time monitoring and control using battery, solar PV and site meters
- 1 EV School bus and 3 standard EV charging stations

Output Features

- More carbon free energy production than the school needs for optimal energy market participation
- Grid energy needed can be downloaded at night into the battery for use during the day if solar energy not sufficient. to supply load
- School able to operate in microgrid mode whenever required
- Able to participate in Ontario electricity market

EAST END SOLAR CAR PORT ARRAY

1.1MW/2.2MWH BESS

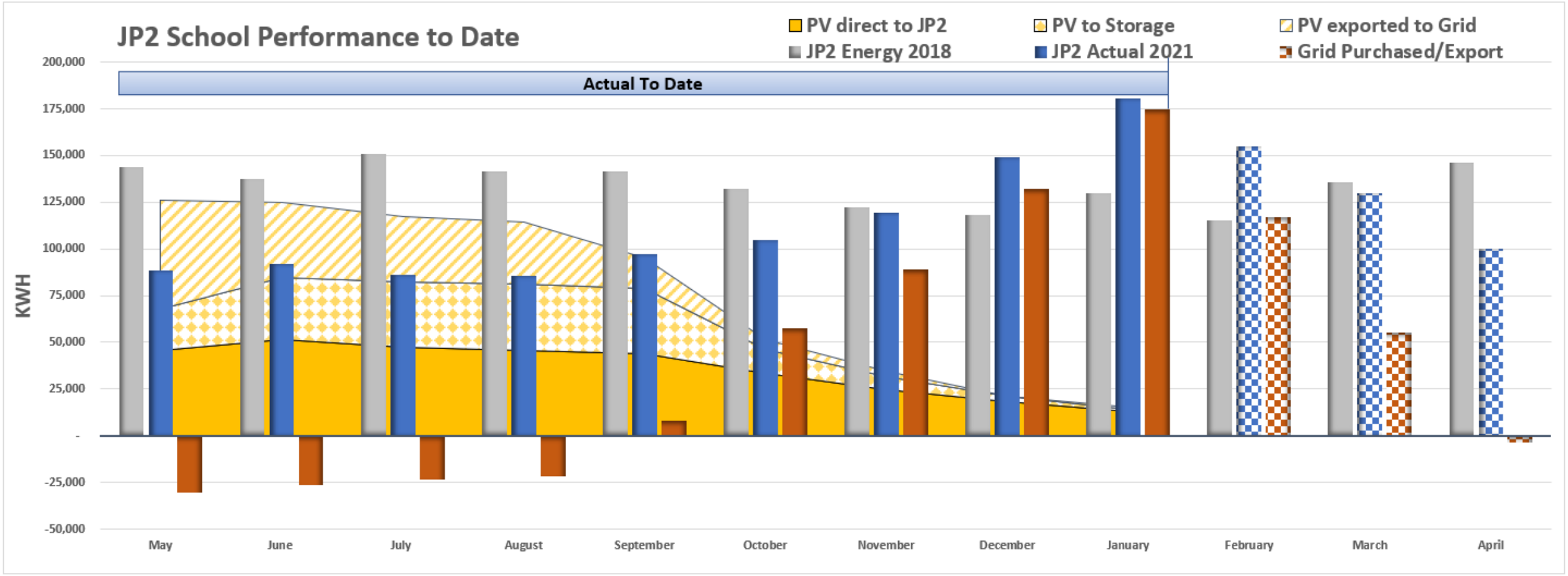
EAST END EV CHARGING

EV SCHOOL BUS HS CHARGING

WEST END SOLAR CAR PORT ARRAY

Looking Forward – JP II Success

Summary Data May to January

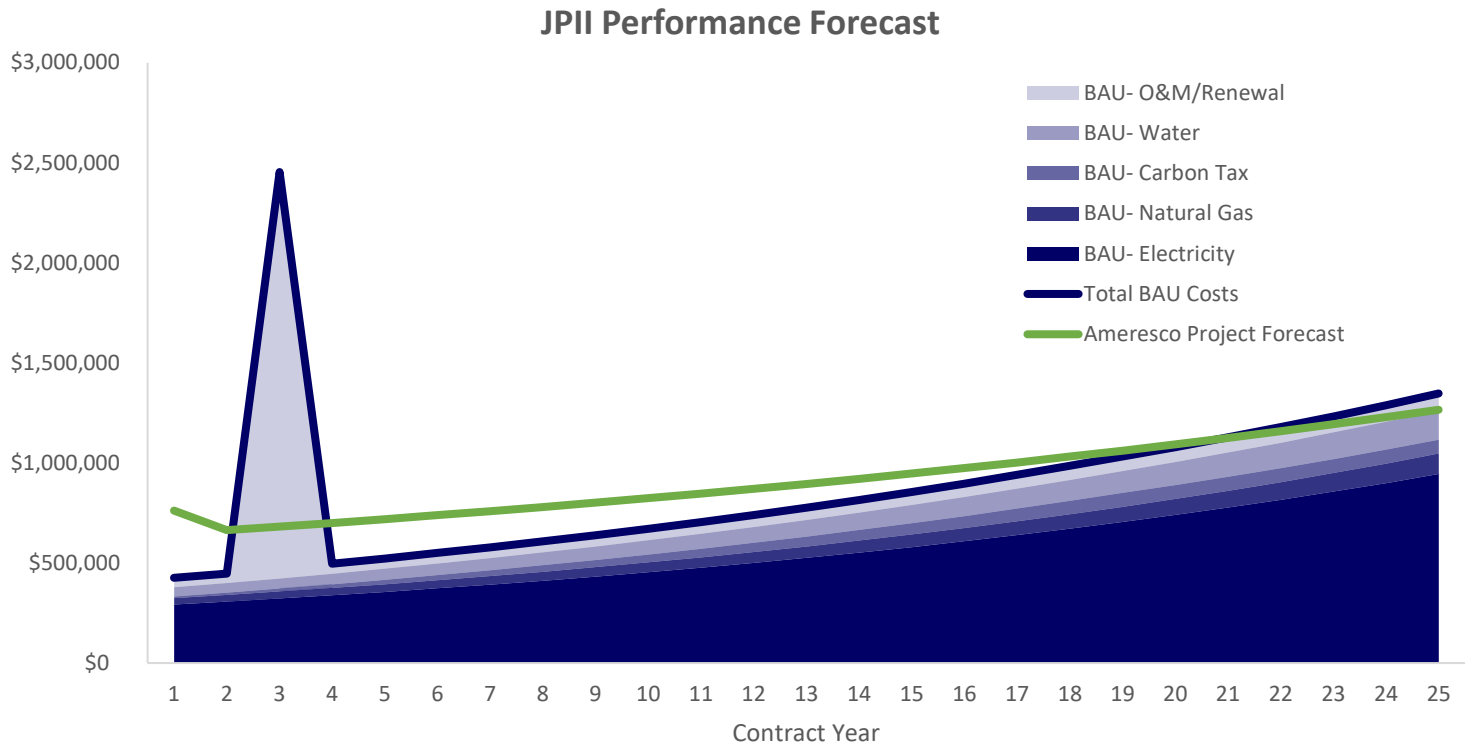


Summary Data May to January

Period	2018 Year Bldg. kWh	2022 Current Bldg. kWh	% reduction	PV Generation kWh	Grid Energy Purchased Import/(export) kWh	GHG Base tCO_2e	GHG Base tCO_2e
May - January	1,219,235	1,003,820	17.6%	725,466	(358,734)	28.6	Below zero

Projected Financial Performance for JPII

- Carbon pricing facilitated the economics of the project
- The NPV of this project over the 25-year period is indicating that the business-as-usual scenario, which included carbon emissions, is slightly more expensive than the carbon free EaaS model



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Thank You!

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