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TECHNICAL MEMORANDUM – FINANCIAL EVALUATION REV6

Extropic Project No.	25E034	**Date Issued**	January 28, 2026
Project Name	Penticton Microgrid		
Client	City of Penticton		
Client Contact	Draydan Power		
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BACKGROUND & PURPOSE

The City of Penticton contracted a consulting company to complete a Penticton area generation study in 2019 which concluded that using a Battery Energy Storage System (BESS) for peak shaving would substantially reduce FortisBC demand charges and improve control over municipal energy use. The City seeks to lower GHG impact, lower long-term electricity costs, enhance energy resiliency, and support sustainability goals by integrating a Solar + Battery Energy Storage System (BESS) into municipal operations. The project has received conditional approval through a grant program, significantly reducing the net capital burden on the City.

DISTRIBUTED ENERGY RESOURCES AND MICROGRID BENEFITS

The modelling of the City of Penticton's historical electrical data, spanning 8760 hours (one year), demonstrates that a 2.5MW/10MWh nameplate capacity BESS provides the ideal capacity for peak demand reduction. The battery will only be used at full capacity for a limited period throughout the year, typically during a strong winter peaking event. The remainder of the year, the BESS will be charged to 90% and only discharged to a maximum of 20% to prolong the lifespan of the cells.

Multiple systems and scenarios were modelled in previous revisions, including a 680kW solar PV system in the City Yard with rooftop solar on the operations, vehicle bays, and fleet buildings, along with a solar canopy above the parking lot. The solar system chosen is to replace the canopy solar at the City Yard with rooftop solar on the new firehall building at 285 Dawson Avenue, for a total of 691kW. It should be noted that with this configuration, it's assumed that the city has included the new firehall into the larger microgrid, and the firehall solar will contribute to the larger microgrid, rather than directly to the City Yards microgrid where the BESS is located. This system will produce clean energy for municipal loads and reduce the need for imported electricity from FortisBC.

The project will create a large microgrid of City municipal buildings capable of serving as a resiliency hub, supplying backup power during severe weather or grid disruptions. This installation marks the first step in a broader microgrid strategy, with future expansion envisioned for additional generation on city facilities, municipal customers and critical infrastructure.

FINANCIAL OVERVIEW

Financial analyses are presented for the chosen scenario and include all grid infrastructure, reclosers and switches, and the replacement of the solar canopy structure with rooftop solar at the newly proposed firehall.

The BESS system is designed to reduce peak demand by the full nameplate power output of 2,500kW; but in practice, we anticipate that peaks may be partially reduced by 80% rather than fully shaved. This peak reduction accuracy of 80% is to account for the scenario of missing the peak for 1 in 5 years (The 80% performance certainty factor reflects expected partial peak capture during miss events, such that even when the absolute peak is not fully avoided, the BESS continues to reduce ratcheted billing demand materially).

Our dispatch algorithm is expected to lower monthly peak demand by 2,000 kW once calibrated to the facility's load patterns. While the full 10 MWh battery capacity will primarily not be used, the system can deploy its entire storage during extreme cold events or periods of unusually high demand to ensure effective peak shaving. The Wires Demand Reduction assumes an 85% reduction from the Power Supply Demand Reduction and represents a typical year of ratcheted demand.

The anticipated demand reductions from the BESS is shown below:

BESS	
Power Supply Demand Reduction (kW-month /year)	Wires Demand Reduction (kW-month /year)
24,000	**20,400**

The anticipated demand and energy reductions from the chosen solar system configuration is shown below:

691kW Total W/ Firehall Solar	
Demand Reduction (kW/year)*	Energy Reduction (kWh/year)
1,266	**700,067**

*The demand reduction is a yearly summation of the solar contribution to the peak. Since the peak power occurs in the evening, only a portion of the capacity of the solar system is available since power availability reduces as time gets towards the evening when it is dark. The numbers presented here are based on the modelling of the time and production of the solar system operating during the COP peak period.

The chosen scenario demonstrates that the system delivers strong economic performance across its lifespan. The annual savings are derived largely from the reduced FortisBC demand charges to the City, as well as less energy purchased through solar generation, both of which increase in value yearly due to the ability to avoid electricity rate increases. It should be noted that the solar system contributes minimally to peak demand during the winter months due to the city's peak occurring outside of production hours.

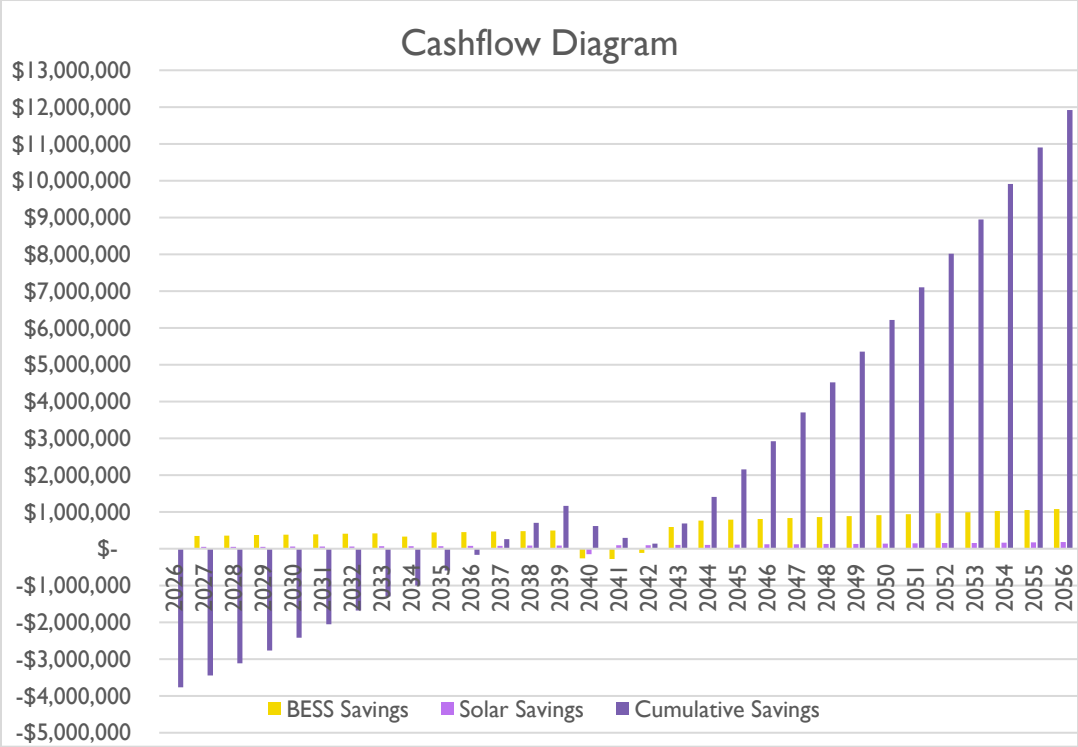
In the financial evaluation, operations, maintenance, insurance, and replacement costs are adjusted for inflation, and all costs and revenues are modelled in nominal dollars. Inflation, utility energy cost escalation, and the NPV discount rate are applied consistently based on client-provided values. The payback period shown is based on cumulative nominal cash flow, including escalated energy savings and inflation-adjusted costs. A more simplified payback period based on average annual net cash flow yields a typical shorter value, but is not used as the primary metric due to non-uniform cash flows. Battery cell replacement is modelled over three years, beginning in Year 14, and the inverter is also replaced in Year 14. It is assumed that project capital is spent in 2026, and 2027 represents year 1 of operations and revenue.

CHOSEN SCENARIO – 691KW SOLAR/2500KW BESS WITH ALL RECLOSERS AND SWITCHES + INCREASED CONTINGENCY

Initial Capital Costs ($)	$9,281,444
Conditionally Approved Funding (up to 50%)	$4,640,722
Additional Funding (10%)	$928,144
Net Project Costs	**$3,712,578**
Project Contingency (included in Net Project Costs)	**15%**

As shown in the cash flow diagram, the capital costs are recouped in year 11, before the replacement of the battery cells begins in year 14. 11 years is also considered the true payback of the project as the cumulative cashflow remains

positive while considering the capital replacements necessary. Replacing the canopy solar with roof top solar on the large south facing roof of the firehall provides better solar returns with lower capital costs, although the logistics of the microgrid configuration to include the firehall's rooftop solar would need further analysis. The additional 10% funding to achieve the financial outcomes can come from a variety of sources, such as the federal government's Clean Electricity ITC or the Green Municipal Fund for community clean energy capital projects.



Payback Period Including Cell Replacement	**11 years**
Return on Investment	**321%**
NPV – 3.8% Discount Rate	**$4,118,206**

SUMMARY

This project offers a financially sound investment that reduces electricity costs to the City, supports climate goals, and enhances community resiliency. This project aligns with the City's strategic priorities, including sustainability, cost efficiency, modernization of municipal assets, and improved resilience against extreme weather events. The scenario modelled represents a financially successful endeavor and creates long-term value for the City and a future-ready electrical distribution system that can integrate renewable power into its electrical grid.

FINANCIAL MODEL INPUTS

Below are the inputs and assumptions used in our financial analysis:

Utility Purchase Rate ($/kWh)	$0.0689
Utility Power Supply Charges ($/kVA)	$6.17
Utility Wires Charges ($/kVA)	$11.49
Inflation	4%
Electricity Cost Escalation	4.84%
BESS Maximum Capacity (kWh)	10,000
BESS Degradation Yr 1-	1.50%
BESS O&M Costs ($/year)	$15,000
BESS Cell Replacement (yrs)	14,15,16
BESS Cell Replacement Cost	$1,335,714
Solar Size (kW)	691
Solar Panel Degradation Yr 1-	0.40%
Inverter Replacement (year)	14
Inverter/Converter Replacement Cost	$140,000
Solar O&M Cost ($/Wdc/year)	$0.01
Smart Microgrid O&M Costs ($/year)	$75,000
Insurance Costs ($/year)	$30,000
Battery Peak Reduction Accuracy	80%