Affordable, Replicable and Marketable Net Zero Ready MURBs

Analysis by Wil Beardmore, Bluewater Energy with supporting documentation from Andrew Beacom, Priority Submetering Solutions

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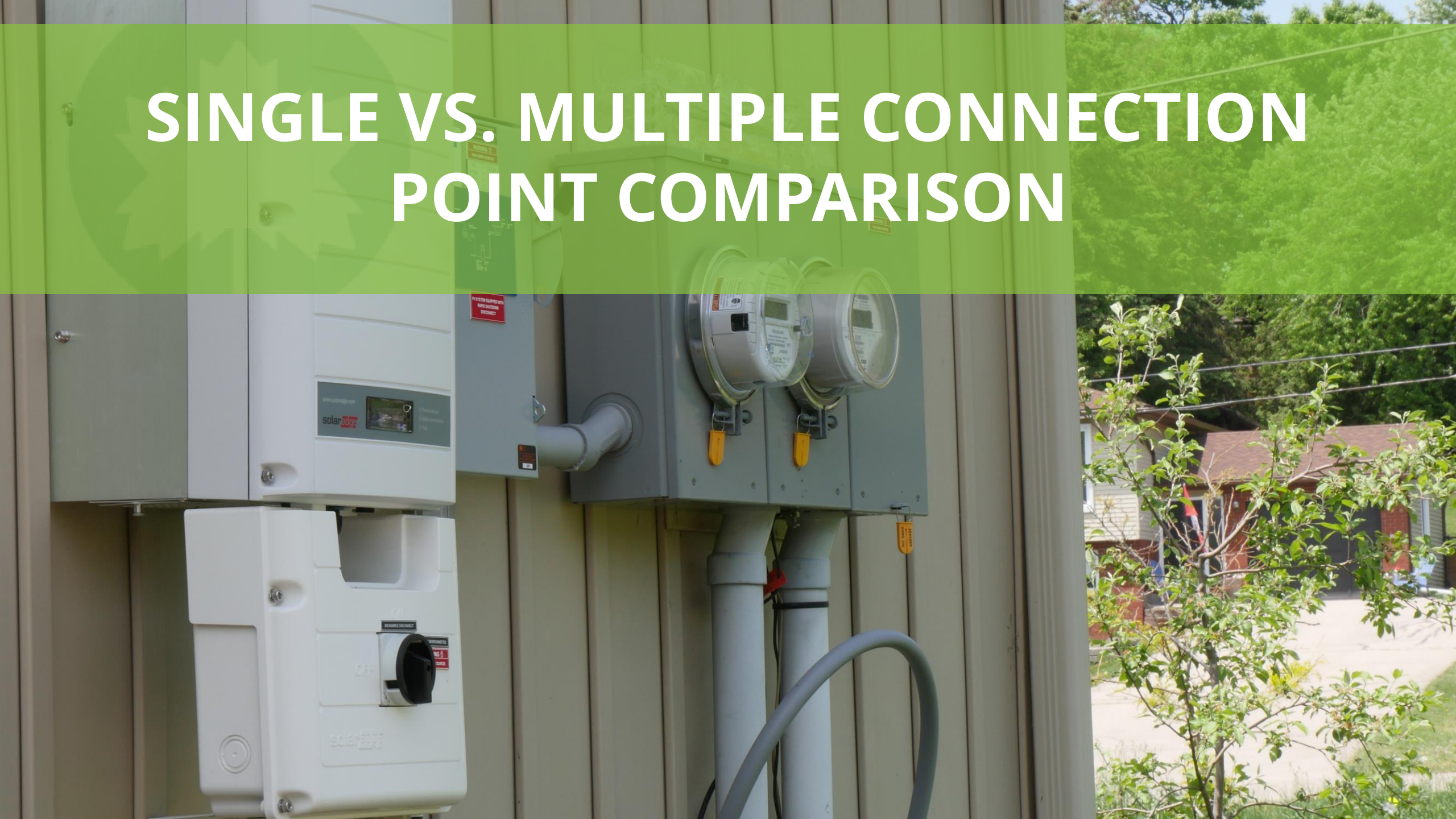
Project Objective

To **validate the use of panelized/modular construction** and **integrated mechanical system** technologies, design and construction practices on **Net Zero or Net Zero Ready MURBs** to optimize energy efficient performance, **reduce costs**, increase construction productivity and reduce construction schedules.

Specifically:
Should Net Zero MURBs use one or multiple PV arrays and points of connection to the utility grid?

SINGLE VS. MULTIPLE CONNECTION POINT COMPARISON



Project Comparison Specs

	PV Modules	DC Capacity	Inverters	AC Cacpaity	Transformer
Unit Level x 12	384	138.24kW	12	120kW	0
MURB Level	384	138.24kW	2	125.2kW	1

- 12 x units connecting 11.52kW DC / 10.0kW AC to each unit individually
- MURB connection 138.24kW DC / 125.2kW AC to single connection point with Suite Level Sub-Metering

Design and Permitting

	Unit Level 12 x 10kW	MURB Level 120kW	
Design and Permitting			
Utility Connection Fees	$ 9,600	$ 10,000	
Project Design	$ 400	$ 2,000	
Electrical Engineering	$ -	$ 2,500	
CIA Application Fee	$ -	$ 6,000	
ESA Plans Review	$ -	$ 1,200	
Structural Engineering	$ 9,000	$ 3,000	
Building Permit	$ 3,600	$ 1,500	
Electrical Permit	$ 3,840	$ 1,600	
Sub-Total	$ 26,440	$ 27,800	-5.1%

Ontario Specific – Check Local Utility Costs for your Jurisdiction/ Province

Solar PV Equipment

	Unit Level 12 x 10kW	MURB Level 120kW	
Solar PV Equipment			
Solar Modules	$ 103,680	$ 103,680	
Inverters	$ 62,400	$ 28,000	
Mounting System	$ 24,960	$ 24,960	
Wire/Cable/Conduit	$ 13,824	$ 6,912	
Panels/Combiners/Disconnect	$ 2,340	$ 6,500	
Transformer	$ -	$ 9,500	
Sub-Total	$ 207,204	$ 179,552	13.3%

Mechanical Install

	Unit Level 12 x 10kW	MURB Level 120kW	
Mechanical Installation			
Rooftop Solar Installation	$ 47,002	$ 35,942	
Equipment Rental	$ 12,150	$ 4,320	
Sub-Total	$ 59,152	$ 40,262	31.9%

Connection & Commissioning

	Unit Level 12 x 10kW	MURB Level 120kW	
Connection and Commissioning			
Safety Switch	$ 4,500	$ 3,500	
AC Connection Equip	$ 2,100	$ 10,368	
Electrical Connections	$ 18,240	$ 12,825	
Monitoring Set-up	$ 2,100	$ 1,500	
System Commissioning	$ 1,440	$ 1,500	
Post Installation Engineer Review	$ -	$ 1,500	
Suite Level Sub-Metering	$ -	$ 3,200	
Sub-Total	$ 28,380	$ 34,393	-21.2%

Total Project Costs

	Unit Level 12 x 10kW	MURB Level 120kW	
Total Cost	$ 317,576	$ 282,007	
Cost Per Watt	$ 2.30	$ 2.04	
Difference		$ 35,568	11.2%

Additional Comments

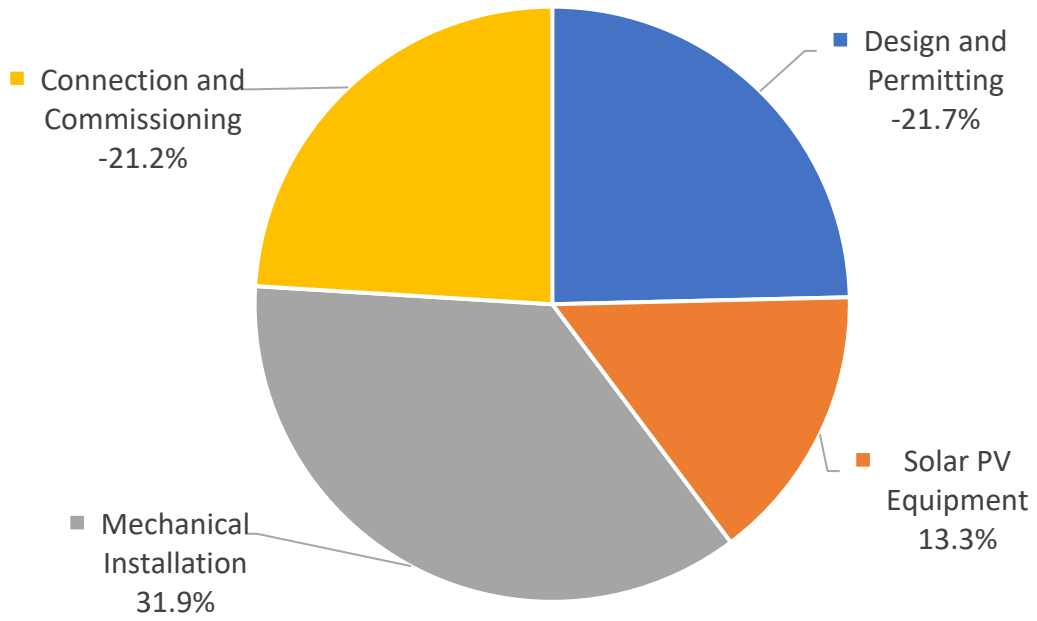
Individual Suite-Level Connections

- Homeowner owns system and is responsible for system maintenance and performance
- No ongoing relationship with homeowner post close
- PV credits are tracked and reconciled with homeowner by utility

MURB Single Connection Point

- Third Party Entity owns PV system and is responsible for system maintenance and performance
- Ongoing sub-metering relationship with tenant or homeowner for billing
- PV credits must be manually tracked and allocated to individual suites

Cost Differences Single vs. Multi-Point Connections



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Life Takes Energy

BC HOUSING

BC Hydro
Power smart

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BUILDING KNOWLEDGE CANADA INC.

Priority
Submetering Solutions

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