

Heating Energy Sub- metering

Measuring building energy savings from
metering heating energy



Agenda

Project Scope

Background

Methodology

Results

Conclusion

Recommendations

Q&A

Project Scope



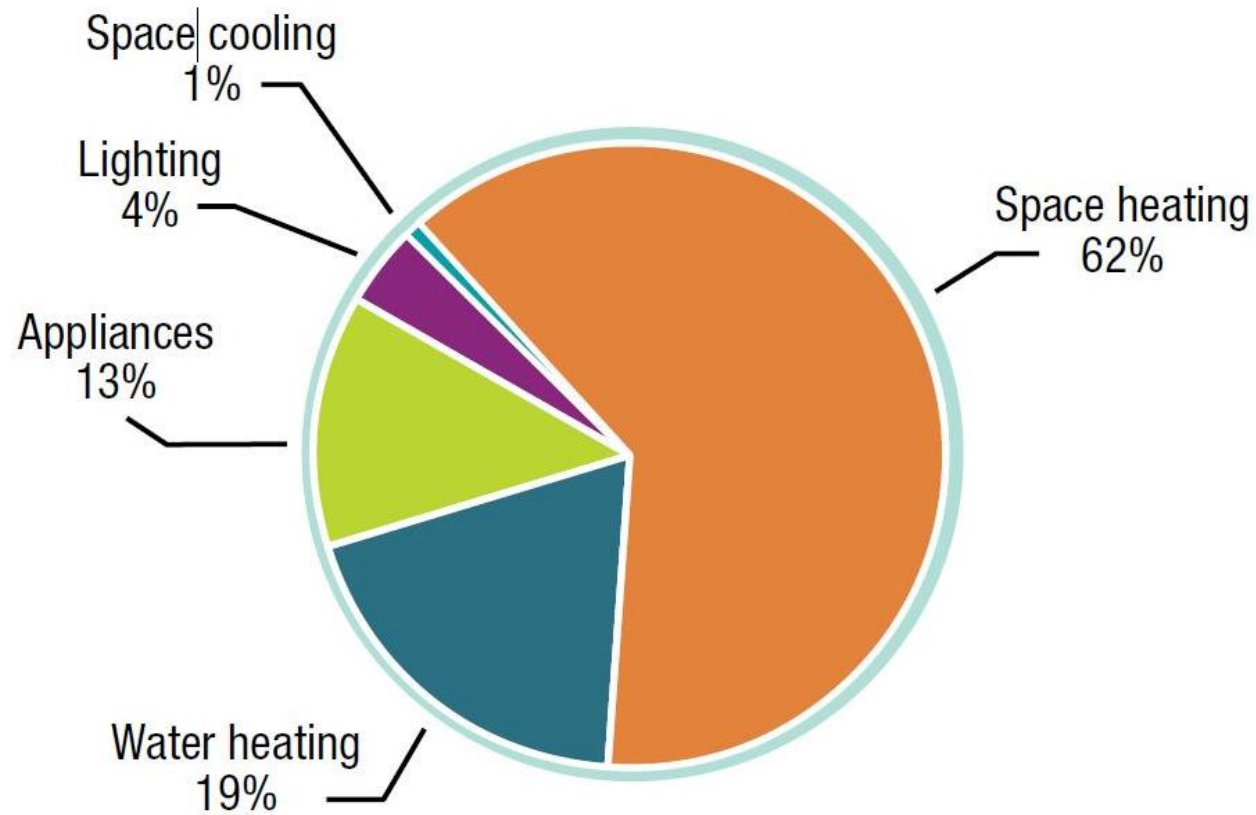
Image property of UBC Properties Trust



Background

Background

► Energy use in residential sector



Background



UBC PROPERTIES TRUST

- ▶ Established 1984 for the development of Hampton Place.
- ▶ Responsible for the development, leasing, and property managing of residential, office and retail portfolios at UBC.



Image property of UBC Properties Trust

Background



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Site D (Focal)

- ▶ Targeting REAP Cert.
- ▶ Area : 73,177 sq.ft.
- ▶ 90 residential units.
 - ▶ Studio : 47 units
 - ▶ 1 Br : 21 units
 - ▶ 2 Br : 20 units
 - ▶ 3 Br : 3 units

Background



Image property of UBC Properties Trust

Site B (Central)

- ▶ REAP Certified.
- ▶ Area : 75,499 sq.ft.
- ▶ 98 residential units.
 - ▶ Studio : 60 units
 - ▶ 1 Br : 9 units
 - ▶ 2 Br : 17 units
 - ▶ 3 Br : 12 units

Background

Sub-metering

- ▶ What is energy sub-metering?
- ▶ Benefits of sub-metering



Background

Building Energy Benchmarking

- ▶ What is Building Energy benchmarking?



Methodology

The background features a complex geometric design. On the right side, there is a solid dark blue vertical band. To its left, several overlapping, semi-transparent shapes in various shades of blue (from light sky blue to medium blue) and white create a layered, abstract effect. A thin, light blue line runs diagonally across the composition, intersecting the various shapes.

Methodology

- ▶ Collecting data for similar buildings.

Building	Area (m ²)	Units	2016		2017		Build Standard Certification
			Space Heating (kWh)	DHW (l)	Space Heating (kWh)	DHW (l)	
Building 1_1	7,494	95	286,347	8,033,300	365,860	8,288,200	REAP
Building 1_2	6,075	77	203,454	4,132,300	299,854	3,901,183	REAP
Building 2	5,880	70	80,386	2,996,640	92,711	4,528,412	LEED Gold
Building 3	4,084	67	155,510	266,497	190,561	270,685	LEED Gold
Building 4	7,433	84	195,569	775,968	263,963	263,963	LEED

All building utilise hydronic space heating systems.

Methodology

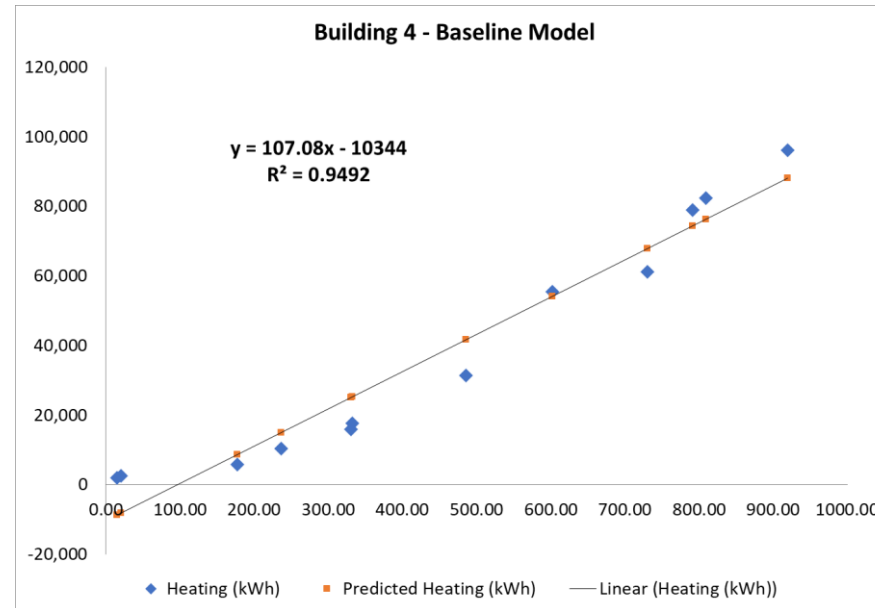
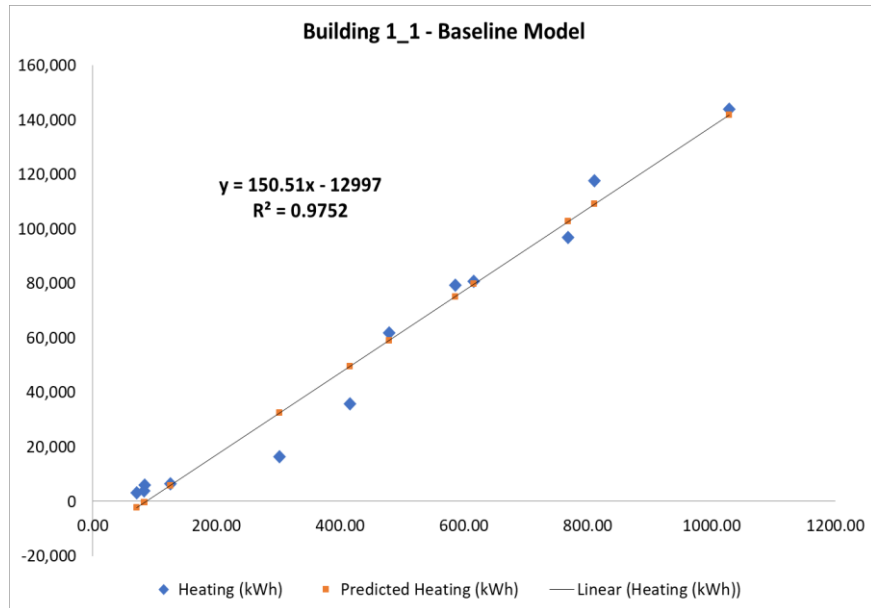
► Energy Data Analysis

Building	Area (m ²)	Units	2016		2017	
			Space Heating (kWh)	SHEUI * (kWh/m ²)	Space Heating (kWh)	SHEUI * (kWh/m ²)
Building 1_1	7,494	95	286,347	38	365,860	49
Building 1_2	6,075	77	203,454	33	299,854	49
Building 2	5,880	70	80,386	14	92,711	16
Building 3	4,084	67	155,510	38	190,561	47
Building 4	7,433	84	195,569	26	263,963	36

* SHEUI : Space Heating Energy Use Intensity

Methodology

- ▶ Building a baseline model for each of the selected buildings



Methodology

- ▶ Building a benchmark baseline for sub-metred buildings

Building	Area (m ²)	Utilization	HDD Coefficient	Intercept	SHEUI * (kWh/m ²)
Building 1_1	7,494	97.81%	150.51	-12996.54	49
Building 1_2	6,075	97.19%	121.19	-12285.11	49
Building 3	4,084	98.70%	79.13	-3551.48	47
Building 4	7,433	98.81%	107.08	-10343.68	36
Benchmark	6,271	98.13%	114	-9,794	45
Site-B	6,318	100 %	127	3,125	62

Methodology

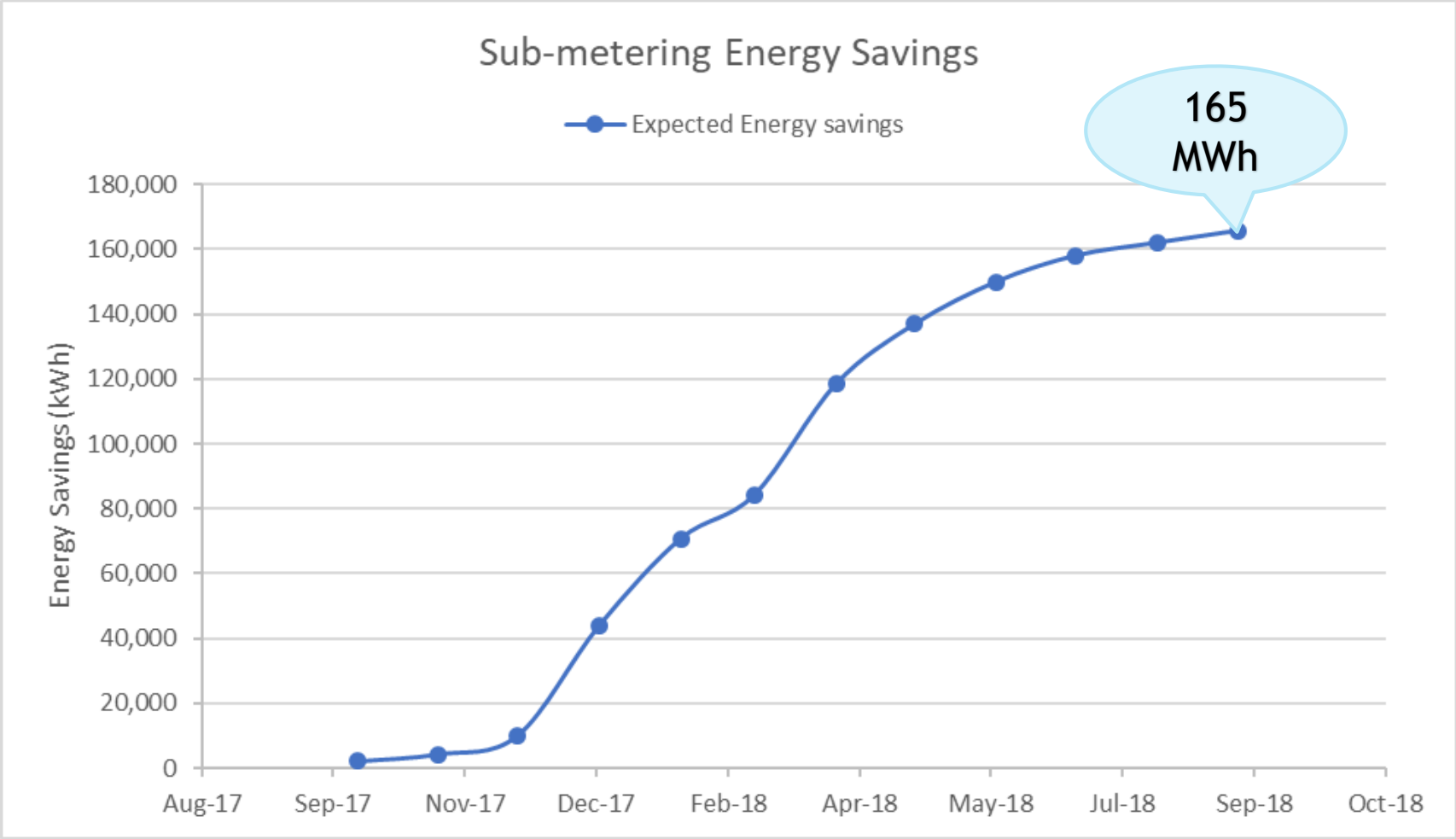
▶ Adjusted Benchmark.

Building	Area (m ²)	Utilization	HDD Coefficient	Intercept	SHEUI * (kWh/m ²)
Benchmark	6,271	98.13%	114	-9,794	45
Adjusted Benchmark	6,318	100 %	117.65	-10,073	46
Site-B	6,318	100 %	127	3,125	62

Results

The background features a series of overlapping, semi-transparent geometric shapes in various shades of blue, ranging from light sky blue to a deep, dark navy blue. These shapes are primarily triangular and polygonal, creating a dynamic, layered effect. The shapes are positioned on the right side of the frame, extending towards the center. The left side of the image is a plain white background, which provides a high-contrast backdrop for the blue text.

Results



Results



70,000 miles



28 TCO₂ e



321 years



Results

- ▶ Site-D space Heating Energy baseline :

$$E = 85.57 \text{ HDD} - 7325.93$$

Where:

E Space heating energy in kWh

HDD Heating Degree Days

- ▶ Compared to Site-B baseline model ($E = 127 \text{ HDD} + 3125$), it appears that Site-D would be using much less energy for space heating than Site-B.

The background features a complex geometric design with overlapping translucent shapes in various shades of blue, ranging from light sky blue to deep navy blue. The shapes are primarily triangular and polygonal, creating a dynamic, layered effect. The right side of the image is dominated by a solid, dark blue vertical band.

Conclusion

Conclusion

- ▶ Domestic Hot Water (DHW) consumption is consistent through out the year and doesn't vary by temperature change.
- ▶ Applying Energy submetering would result in 26.6 % reduction in Heating Energy Use Intensity.
- ▶ A similar reduction in GHG emissions is also expected
- ▶ Applying submetering might have a positive effect on resident's behaviour leading to energy conservation

Recommendations

The background features a series of overlapping, semi-transparent blue geometric shapes, including triangles and polygons, that create a dynamic, layered effect. The colors range from light sky blue to a deep, dark navy blue. The shapes are primarily located on the right side of the frame, extending towards the center.

Recommendations

- ▶ Partial sub-metering to be applied to Site-B.
- ▶ Site-D to operate for one year on a pay per area basis, then switch to sub-metering.
- ▶ Facilitating residents access to their energy consumption.

Thank you !



Questions?