Residential Building Electrification Data Gap

Using Energy Models to Assess Grid Impacts

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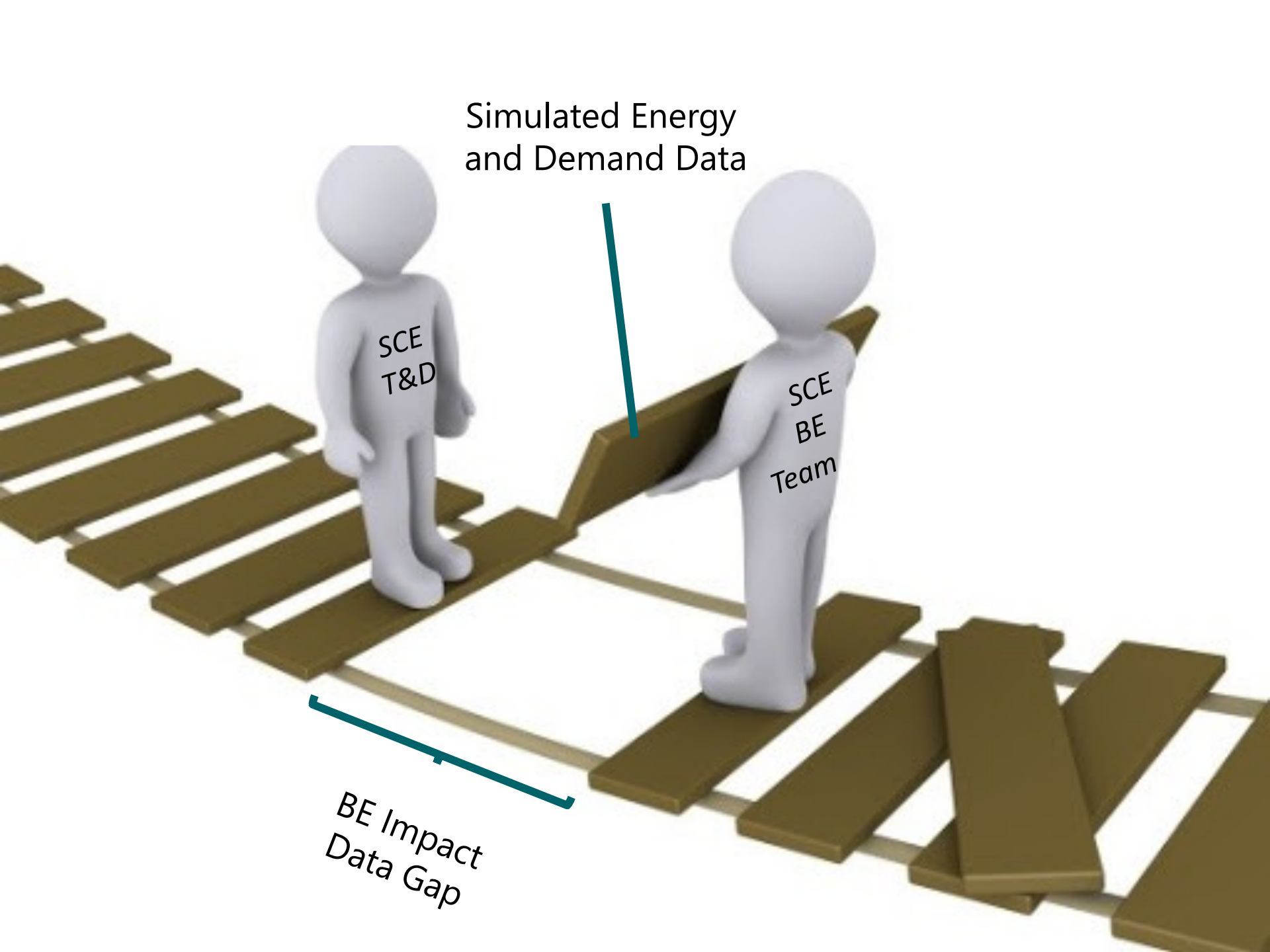

Simulated Energy
and Demand Data
SCE
T&D
SCE
BE
Team
BE Impact
Data Gap

Example Residential New Construction Transformer Sizing
SCE Climate Zone 1 (CEC CZ06)

		Maximum Number of Customers Per Transformer		
Home Square Footage	Assumed Average A/C Tonnage	25 kVA	50 kVA	75 kVA
800	2	8	15	22
2600	5	4	10	15
5000	9	2	5	8

What happens to these numbers when we go all-electric?

Energy Models

- New construction focused (just a start)
- Modeled using NREL's BEopt (Building Energy Optimization Tool)
- Over 1,100 modeled variations, including:
  - 2 code vintages (2019 & 2022)
  - 22 single family square footage variations
  - 11 multifamily square footage variations
  - 9 CEC climate zones in SCE service area
  - Mixed fuel and all-electric

	Type	CFA	CZ	T24	Fuel	
	Single Family	800	5	2019	Mixed	
		1000	6	2022	Electric	
		1200	8			
		1400	9			
		1600	10			
		1800	13			
		2000	14			
		2200	15			
		2400	16			
		2600				
		2800				
		3000				
		3200				
		3400				
		3600				
		3800				
		4000				
		4200				
		4400				
		4600				
		4800				
		5000				Total
Variations	1	22	9	2	2	**792**

	Type	CFA	CZ	T24	Fuel	
	Multifamily	600	5	2019	Mixed	
		800	6	2022	Electric	
		1000	8			
		1200	9			
		1400	10			
		1600	13			
		1800	14			
		2000	15			
		2200	16			
		2400				
		2600				Total
Variations	1	11	9	2	2	**396**

Deliverables

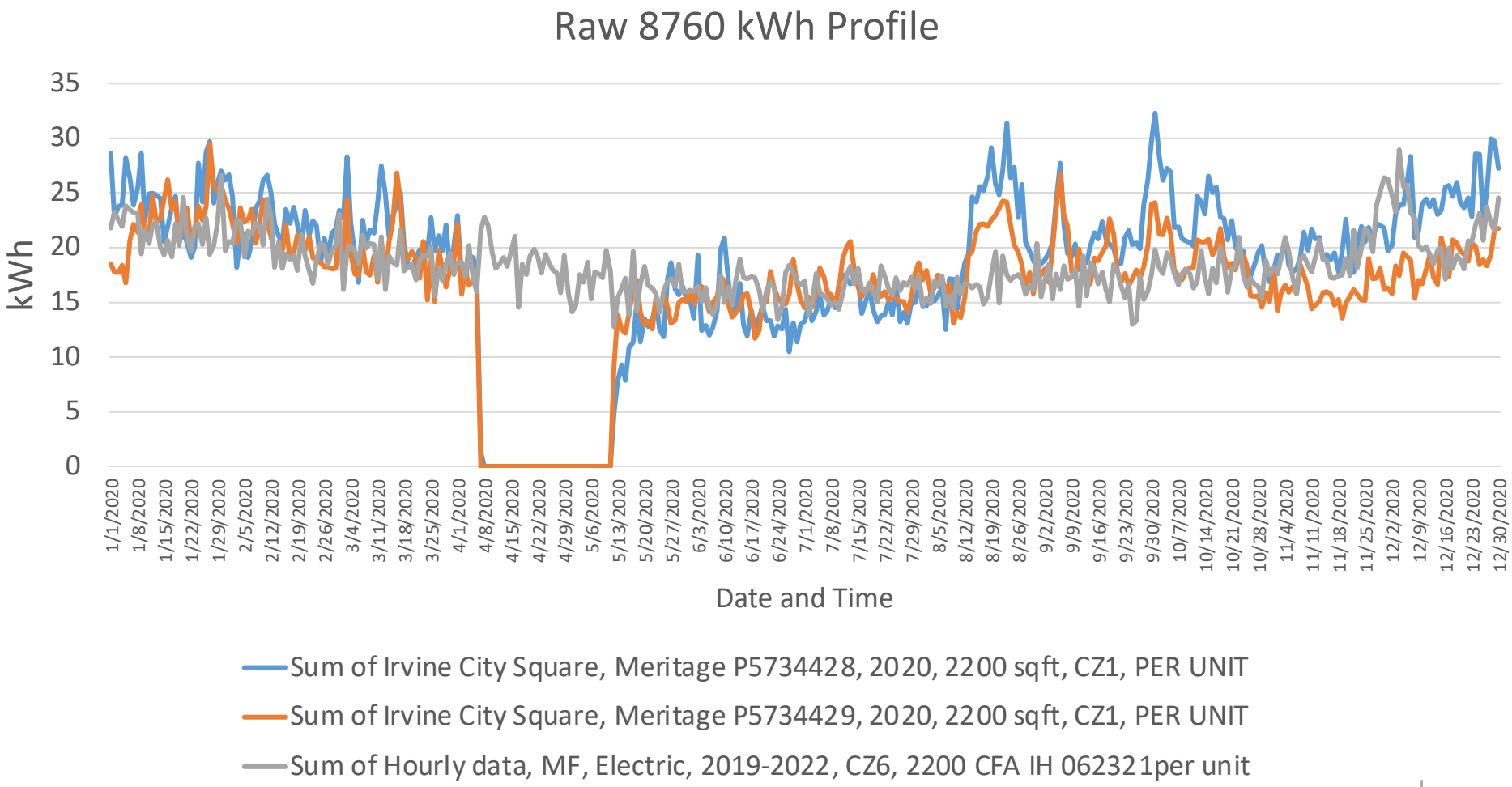
RAW HOURLY DATA

SUMMARY TABLE

BEOPT ENERGY MODELS

Results

Simulated Data Validated!



Old Transformer Sizing
CEC CZ06

Home Square Footage	Maximum Number of Customers Per Transformer		
	25 kVA	50 kVA	75 kVA
800	8	15	22
2,600	4	10	15
5,000	2	5	8

Updated All-Electric Transformer Sizing
CEC CZ06

Home Square Footage	Maximum Number of Customers Per Transformer		
	25 kVA	50 kVA	75 kVA
800	4	12	19
2,600	4	10	15
5,000	2	5	8

Updated Mixed Fuel Transformer Sizing
CEC CZ06

Home Square Footage	Maximum Number of Customers Per Transformer		
	25 kVA	50 kVA	75 kVA
800	7	15	22
2,600	4	10	15
5,000	2	5	8

Surprising Result: HVAC Sizes

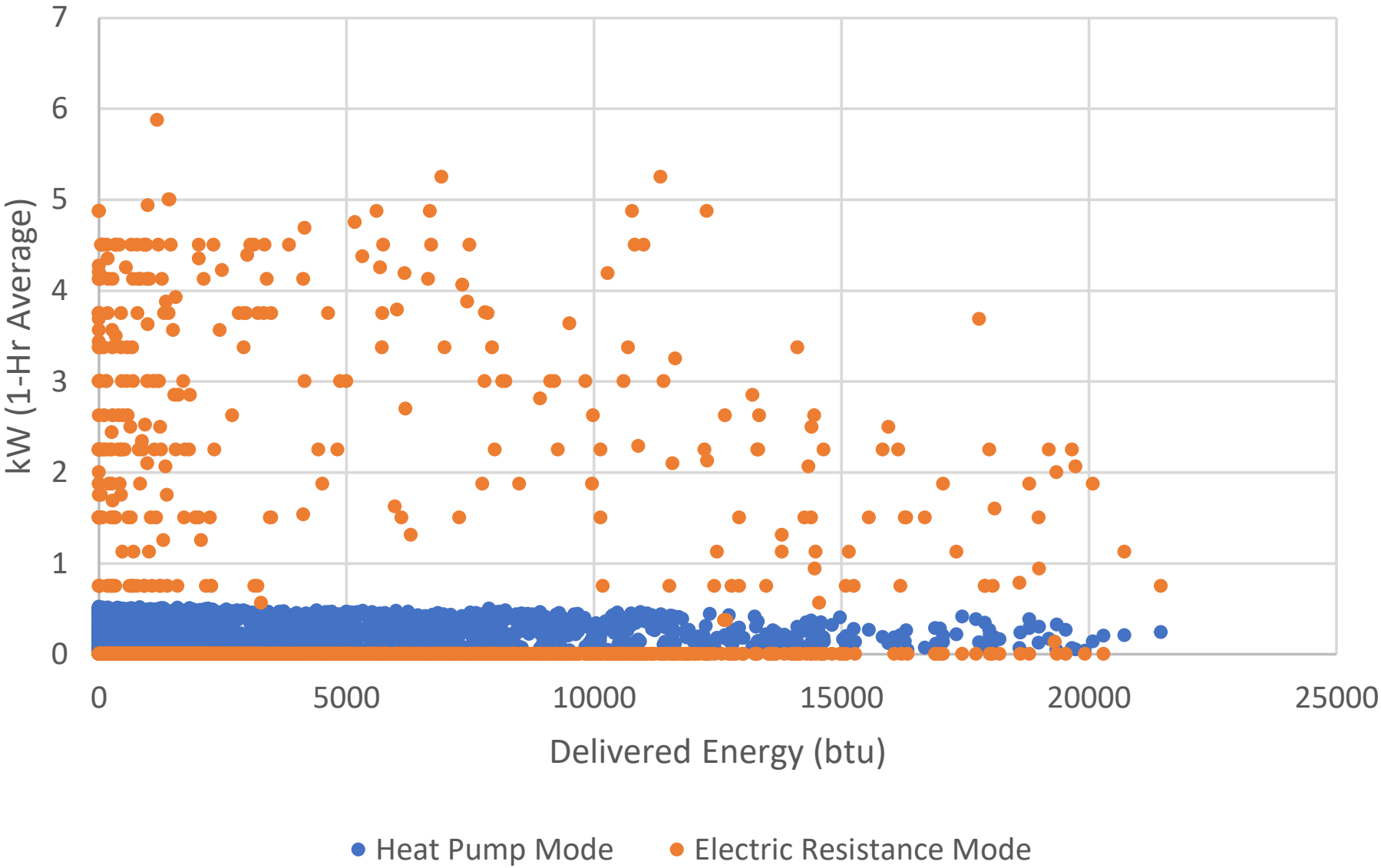
SCE Distribution Design Standars

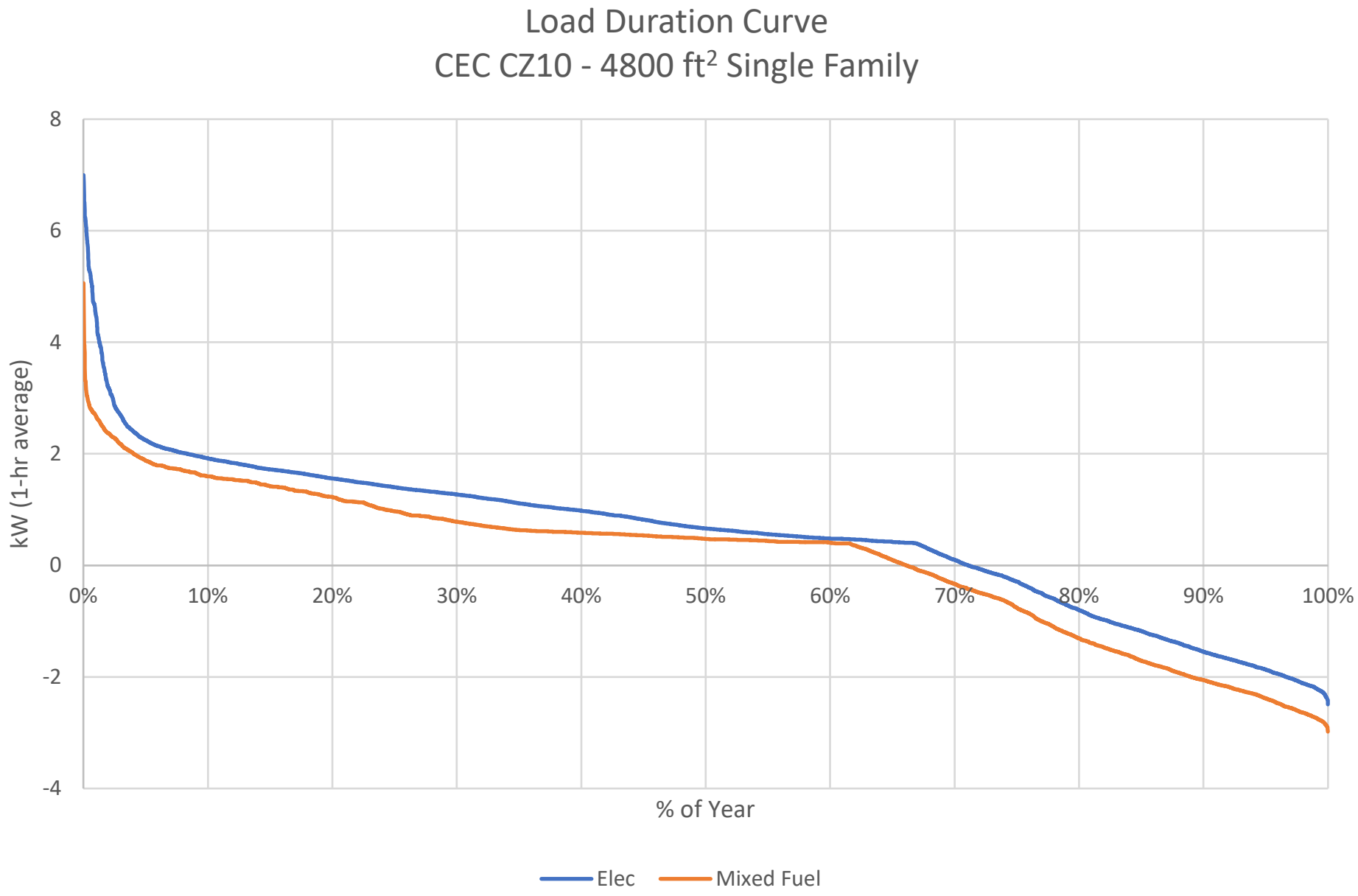
	CEC Climate Zone		
	6	10	14
Home Square Footage	Assumed Average A/C Tonnage		
800	2	2	2
2,800	5	5.5	7
4,800	8.5	9.5	9.5

BEopt Model Results

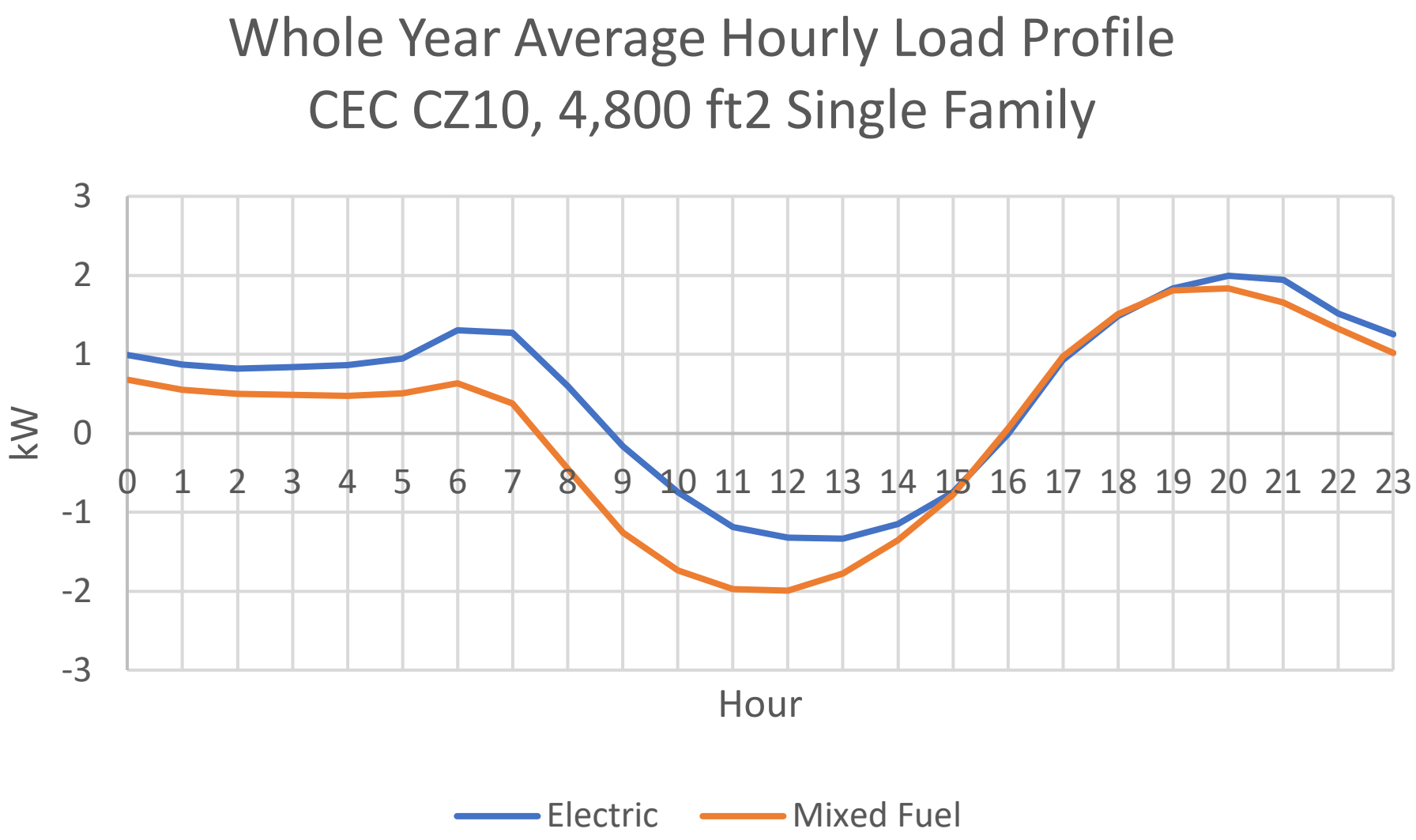
	CEC Climate Zone		
	6	10	14
Home Square Footage	Assumed Average A/C Tonnage		
800	1	1	1
2,800	2	2	2
4,800	2	2	3.5

Heat Pump Water Heater Loads




Load Duration Curve
CEC CZ10 - 4800 ft2 Single Family
8
6
4
2
0
-2
-4
kW (1-hr average)
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
% of Year
Elec
Mixed Fuel

BE Impacts


Whole Year Average Hourly Load Profile
CEC CZ10, 4,800 ft2 Single Family
kW
3
2
1
0
-1
-2
-3
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Hour
Electric
Mixed Fuel

Ongoing Research and Next Steps

- Simulating residential and commercial retrofit scenarios will help:
  - SCE's Transmission and Distribution team understand BE impacts to existing infrastructure.
  - SCE's future BE programs plan and prioritize incentives.
  - SCE develop improved rate structures to support BE.

Questions?