



To BE or not to BE?

Market Potential and Feasibility
of Commercial Building
Electrification (BE)

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San Diego, CA

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Evergreen Economics



Objectives

Provide market data and recommendations to support efforts to **decarbonize** buildings in Southern California with BE.



Who goes first?

Secondary Analysis



Data Sources

- 2006 CEUS
- 2009 RASS
- EIA CBECS, 2021
- McGraw Hill Dodge new construction forecast, 2019-2023
- EPA GHG equivalencies calculator, 2019

Metrics

- Market size: existing stock and construction forecasts
- Gas energy usage/intensity by end use
- Business structure/ease of adoption (low, med., or high)

Priority Business Segments

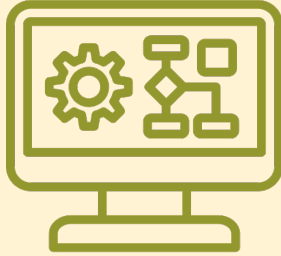


Segment	Existing Stock (1,000 sqft)	New Construction Growth (1,000 sqft)	Total Gas Usage (annual GBtu)	Potential Score	Feasibility Score*	Overall Score	Rank
Restaurant	61,623	2,181	15,349	202	1.5	3.8	1
Health	106,471	11,115	7,272	27	2	1.4	2
Lodging	112,405	16,125	4,601	11	2.75	1.3	3
Multifamily (5+ units)	901,000	109,416	14,648	15	2.25	1.3	4
School	176,999	21,790	2,146	2	3	1.3	5
College	64,809	7,979	1,556	2	2.75	1.2	6
Small Office	157,884	8,975	1,270	1	2.75	1.1	7
Large Office	227,225	12,916	2,949	2	2	1.0	8
Grocery	63,820	2,259	1,392	2	2	1.0	9
Warehouse	383,796	62,247	1,111	1	1.75	0.9	10

* 1=low, 2=medium, 3=high

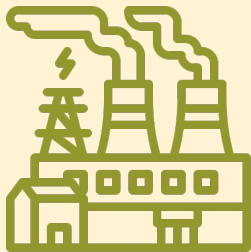
Impacts of BE

Building Simulation



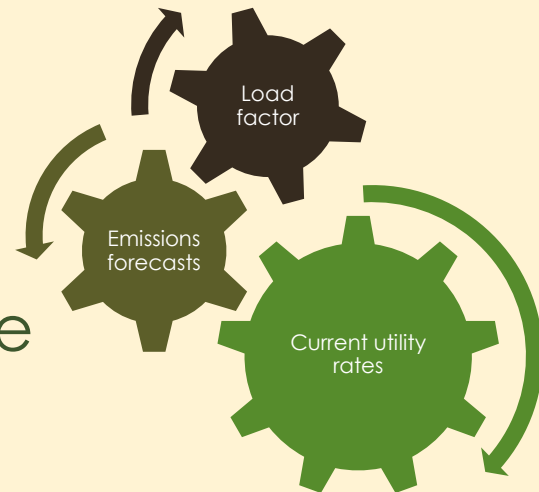
Prototype Model	Scenario	Iterations		
		Baseline	HPWH & HVAC HP	+ Electric Cooking
Restaurant (Fast Food)	Retrofit	✓	✓	✓
	New Constr.	✓	✓	✓
Hotel	Retrofit	✓	HPWH only	N/A
	New Constr.	✓	✓	N/A
Multi-Family	Retrofit	✓	✓	
	New Constr.	✓		✓

Grid & Carbon Impacts



Simulation: hourly energy usage (8,760) for each scenario by end use

- Load factor = peak / average kW
- Hourly CO₂ emissions forecasts by climate zone
- Current tariffs



Carbon Impacts

Prototype Model	Scenario	Climate Zone	Carbon Emissions
Fast Food Restaurant	Retrofit	CZ 09	-7%
		CZ 13	-2%
	New Construction	CZ 09	-12%
		CZ 13	-9%
Hotel	Retrofit	CZ 09	-21%
		CZ 13	-21%
	New Construction	CZ 09	1%
		CZ 13	-1%
Mid-rise Multifamily	Retrofit	CZ 09	2%
		CZ 13	-4%
	New Construction	CZ 09	2%
		CZ 13	-2%

Carbon Impacts

Prototype Model	Scenario	Climate Zone	Carbon Emissions
Fast Food Restaurant	Retrofit	CZ 09	-7%
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	New Construction	CZ 09	-12%
		CZ 13	-9%
Hotel	Retrofit	CZ 09	-21%
		CZ 13	-21%
	New Construction	CZ 09	1%
		CZ 13	-1%
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		CZ 13	-4%
	New Construction	CZ 09	2%
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Increased carbon emissions!

Carbon Impacts

Prototype Model	Scenario	Climate Zone	Carbon	
			Emissions	
Fast Food Restaurant	Retrofit	CZ 09	-7%	Most consistent Carbon reductions
		CZ 13	-2%	
	New Construction	CZ 09	-12%	
		CZ 13	-9%	
Hotel	Retrofit	CZ 09	-21%	Retrofit vs. new construction matters
		CZ 13	-21%	
	New Construction	CZ 09	1%	
		CZ 13	-1%	
Mid-rise Multifamily	Retrofit	CZ 09	2%	Climate matters
		CZ 13	-4%	
	New Construction	CZ 09	2%	
		CZ 13	-2%	

Grid & Carbon Impacts

Prototype Model	Scenario	Climate Zone	% Change after Electrification			
			Carbon	On-Peak	Load Factor	Utility Bills
			Emissions	Demand		
Fast Food Restaurant	Retrofit	CZ 09	-7%	16%	15%	2%
		CZ 13	-2%	37%	15%	-6%
	New Construction	CZ 09	-12%	24%	10%	-1%
		CZ 13	-9%	25%	13%	3%
Hotel	Retrofit	CZ 09	-21%	27%	9%	-4%
		CZ 13	-21%	19%	17%	-6%
	New Construction	CZ 09	1%	71%	27%	17%
		CZ 13	-1%	58%	37%	17%
Mid-rise Multifamily	Retrofit	CZ 09	2%	-1%	30%	-21%
		CZ 13	-4%	3%	21%	-22%
	New Construction	CZ 09	2%	3%	35%	-22%
		CZ 13	-2%	7%	31%	-21%

Grid & Carbon Impacts

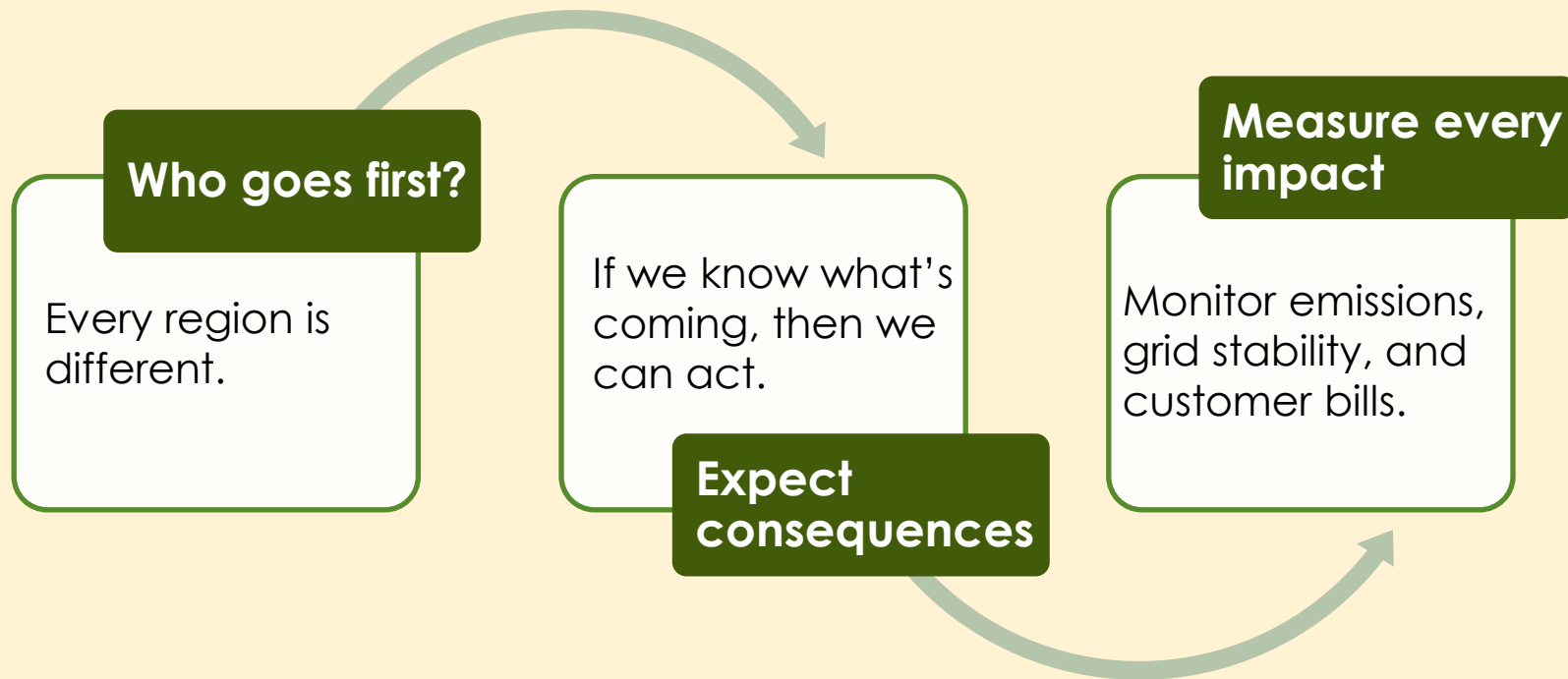
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Grid & Carbon Impacts

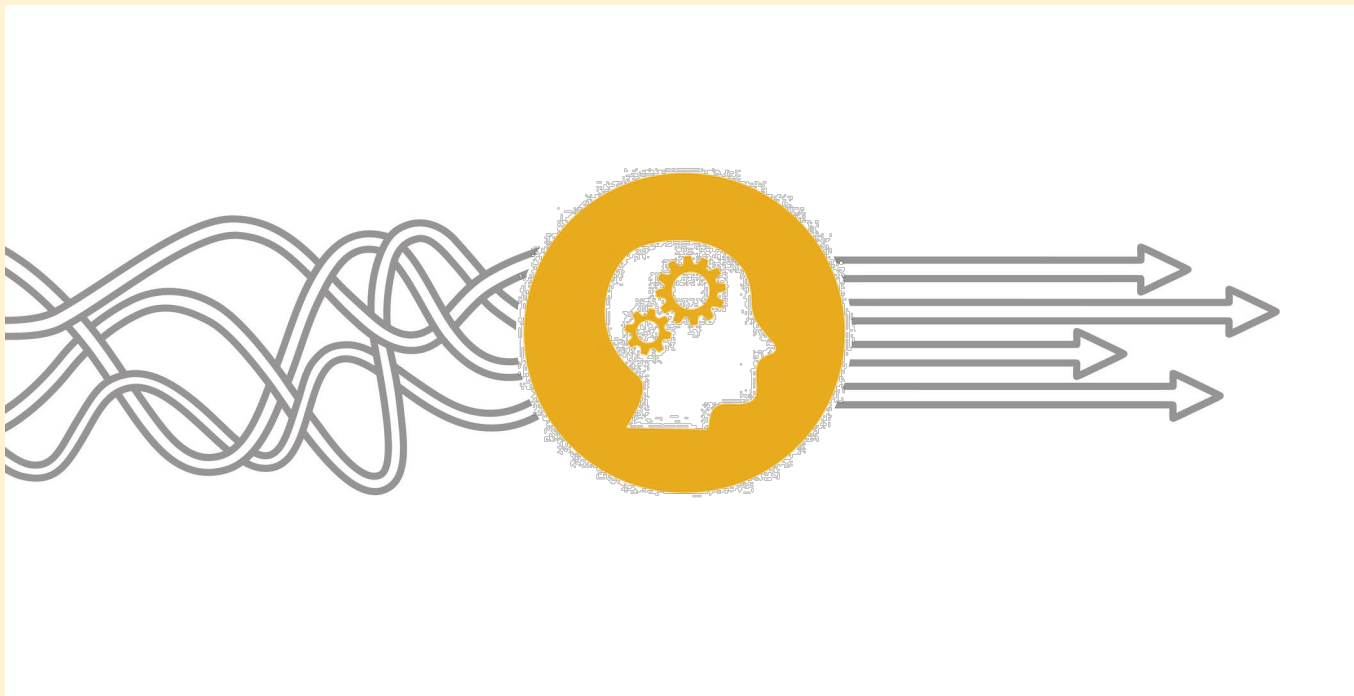
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Key Takeaways

Key Takeaways



Closing





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