



To BE or not to BE?

Market Potential and Feasibility of Commercial Building Electrification (BE)

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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 sgft)	New Construction Growth (1,000 saft)	Total Gas Usage (annual <u>GBtu</u>)	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		lterations					
Model	Scenario	Baseline	HPWH & HVAC HP	+ Electric Cooking			
Restaurant	Retrofit	\checkmark	\checkmark	✓			
(Fast Food)	New Constr.	✓	\checkmark	\checkmark			
Hotel	Retrofit	✓	HPWH only	N/A			
	New Constr.	\checkmark	\checkmark	N/A			
Multi-Family	Retrofit	✓	✓				
	New Constr.	\checkmark		\checkmark			







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



factor

Current utility

Emissions forecasts



Carbon Impacts

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





Carbon Impacts

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Prototype Model	Scenario	Climate Zone	Carbon	
iviouei			Emissions	
	Retrofit	CZ 09	-7%	
Fast Food	Retroilt	CZ 13	-2%	
Restaurant	New	CZ 09	-12%	
	Construction	CZ 13	-9%	
	Retrofit	CZ 09	-21%	
Hotel		CZ 13	-21%	
liotei	New	CZ 09	1%	*
	Construction	CZ 13	-1%	Increased earlies
	Retrofit	CZ 09	2%	Increased carbon emissions!
Mid-rise	Retroit	CZ 13	-4%	Ciliagions
Multifamily	New	CZ 09	2%	*
	Construction	CZ 13	-2%	





Carbon Impacts

Prototype Model	Scenario	Climate Zone	Carbon		
			Emissions		
	Retrofit	CZ 09	-7%		
Fast Food	Rections	CZ 13	-2%		Mantanalatant
Restaurant	New	CZ 09	-12%		Most consistent Carbon reductions
	Construction	CZ 13	-9%		Carbon reductions
	Retrofit New	CZ 09	-21%		
Hotel		CZ 13	-21%	_	D (5)
Hotel		CZ 09	1%		Retrofit vs. new construction matters
	Construction	CZ 13	-1%		Construction matters
	Retrofit	CZ 09	2%		
Mid-rise	Netront	CZ 13	-4%		Climate matters
Multifamily	New	CZ 09	2%		Cililiate matters
	Construction	CZ 13	-2%		





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





D4-4		Climate Zone	% Change after Electrification					
Prototype Model	Scenario		Carbon	On-Peak	Load Factor	Utility Bills		
iviodei			Emissions	Demand	LUAU FACIUI	Othity bills		
	Retrofit	CZ 09	-7%	16%	15%	2%		
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Restaurant	New	CZ 09	-12%	24%	10%	-1%		
	Construction	CZ 13	-9%	25%	13%	3%		
Harai	Retrofit	CZ 09	-21%	27%	9%	-4%		
		CZ 13	-21%	19%	17%	-6%		
Hotel	New	CZ 09	1%	71%	27%	17%		
	Construction	CZ 13	-1%	58%	37%	17%		
Mid-rise Multifamily	Retrofit	CZ 09	2%	-1%	30%	-21%		
		CZ 13	-4%	3%	21%	-22%		
	New	CZ 09	2%	3%	35%	-22%		
	Construction	CZ 13	-2%	7%	31%	-21%		





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





Key Takeaways





Key Takeaways

Who goes first?

Every region is different.

If we know what's coming, then we can act.

Expect consequences

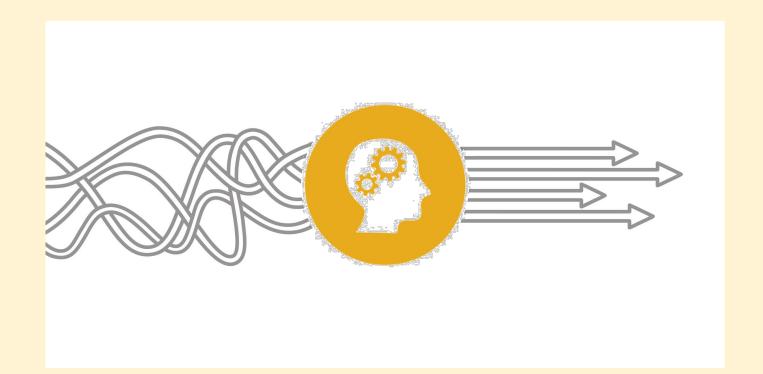
Measure every impact

Monitor emissions, grid stability, and customer bills.





Closing







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