

Ready for Zero? A Retrofit Assessment Framework for Commercial Buildings

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Agenda

- Introduction
 - Why is it important to Decarbonize Nonresidential Buildings?
 - How are Buildings Contributing to GHG?
- The Framework
 - How was the Zero-Emission Retrofit Assessment Model Developed?
 - What is the Zero-Emission Retrofit Assessment Model?
- The Challenge of Retrofitting Commercial Buildings
 - What Drives Retrofits?
 - What Makes Retrofitting Challenging?
- Recommendations
 - What is the Client Impact?
 - How Can Retrofit Needs be Reduced?



Introduction



Introduction

- Imagine replacing your furnace, water heater, and stove with electric versions.
- **Would your breaker panel keep up?**
- Now scale that problem to 8.8 billion ft² of commercial buildings.



Importance of Decarbonizing Nonresidential Buildings



8.8B

Square
feet

Total nonresidential
building space in
California



6%

GHG
emissions

Buildings' share of
California's total
emissions



40%

Potential
reduction

GHG emissions
reduction from
decarbonizing
nonresidential
buildings alone

CARB's 2022 State Strategy **includes a commitment to consider zero-emission standards** for new space and water heaters starting in 2030.

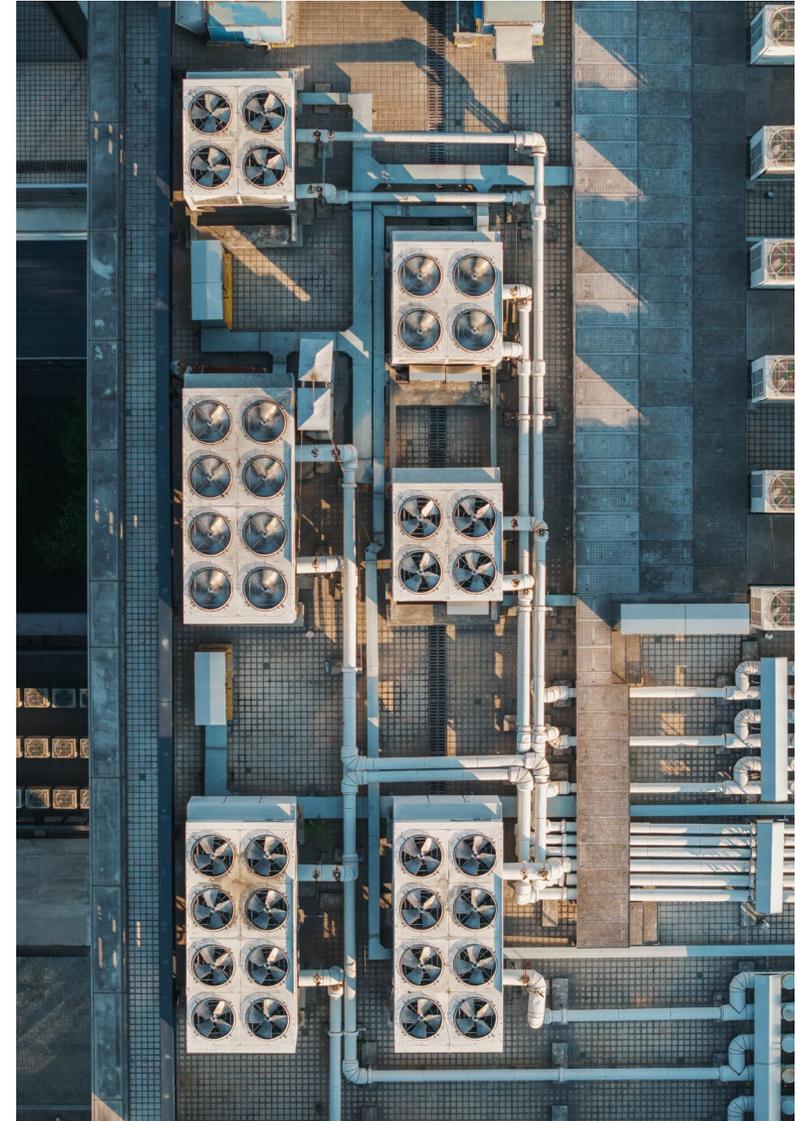


The Framework



Not Just One System at a Time

- Traditional analysis looks at **HVAC, water heating, or cooking separately.**
- But buildings face compounding impacts when **upgrading all at once.**
- Our model **simulates joint retrofit** needs.



Development of the Zero-Emission Retrofit Assessment Model

TRC developed a comprehensive model using ComStock data and engineering analysis to assess retrofit needs across California's building stock.

Five end uses evaluated:

 space heating

 water heating

 cooking

 pool and spa heating

 laundry

Four retrofit criteria:

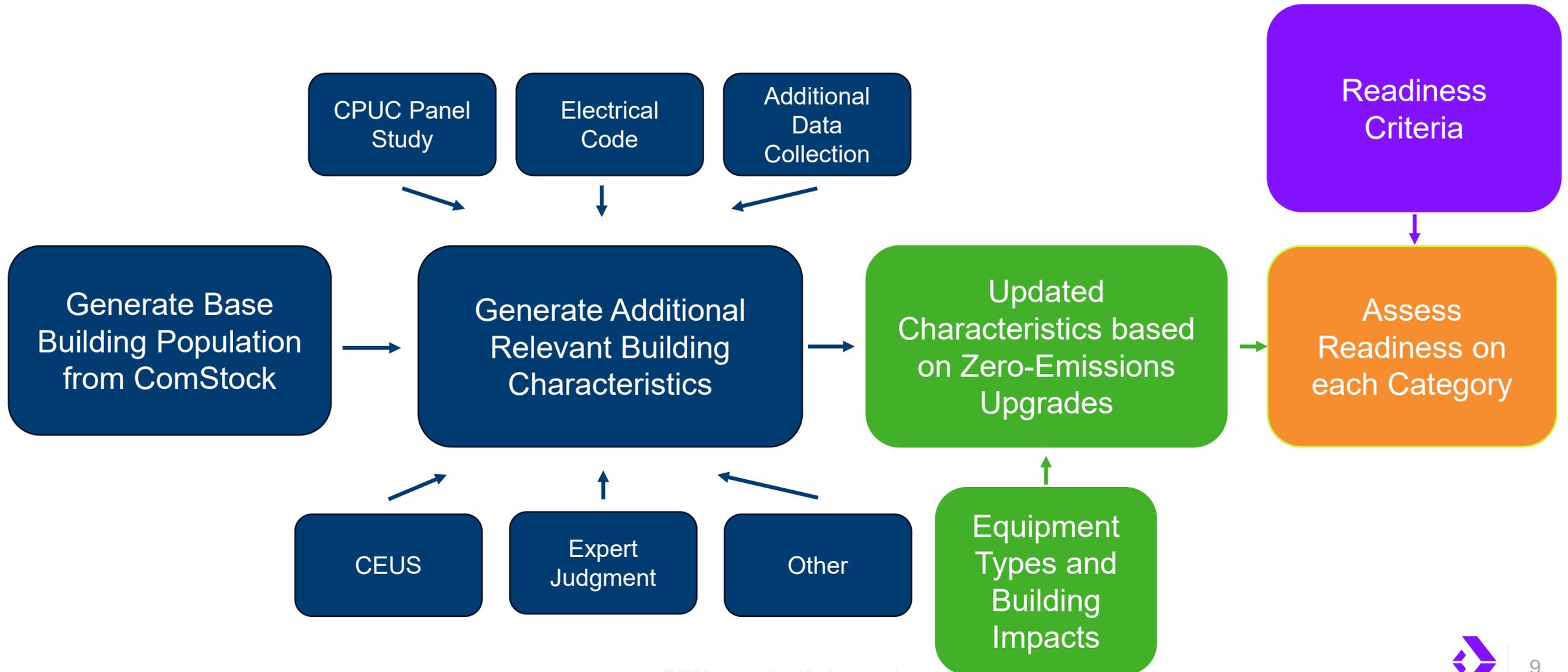
 electrical

 physical space

 heat source

 structural

Zero-Emission Retrofit Assessment Model



The Challenge of Retrofitting Commercial Buildings



Physical space drives retrofits

Physical Space

Physical space is the single biggest constraint with **58%** of buildings requiring a retrofit.

Space Heating

Larger units require **more retrofits for packaged single-zone systems.**

Water Heating

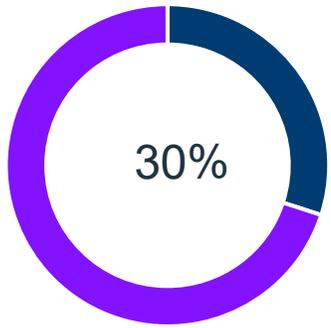
Moderate and major retrofits **increase significantly above 500,000 Btu/h.**

Cooking and Pool

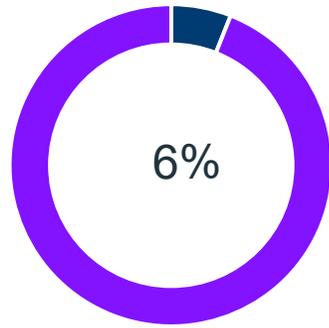
Cooking and pool matter less, but **push peak load higher.**

Compounding Effects: It Adds Up Fast

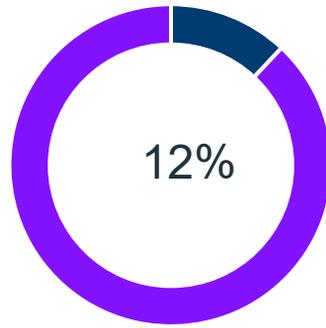
Many buildings that need retrofits **have multiple retrofit constraints.**



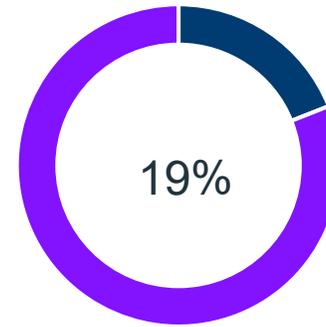
Zero retrofit needs



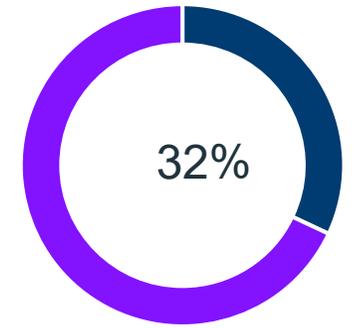
Retrofit needs in 1
categories



Retrofit needs in 2
categories



Retrofit needs in 3
categories



Retrofit needs in 4
categories

This shows the **multiplicative nature** of the problem.

Building Types - Who's Ready And Who's Not?

- **Readiness varies by building type:** Grocery and many restaurants are among the more ready; hospitals and large hotels face big challenges.
- **Buildings with the most retrofit needs:**



Retail
65%



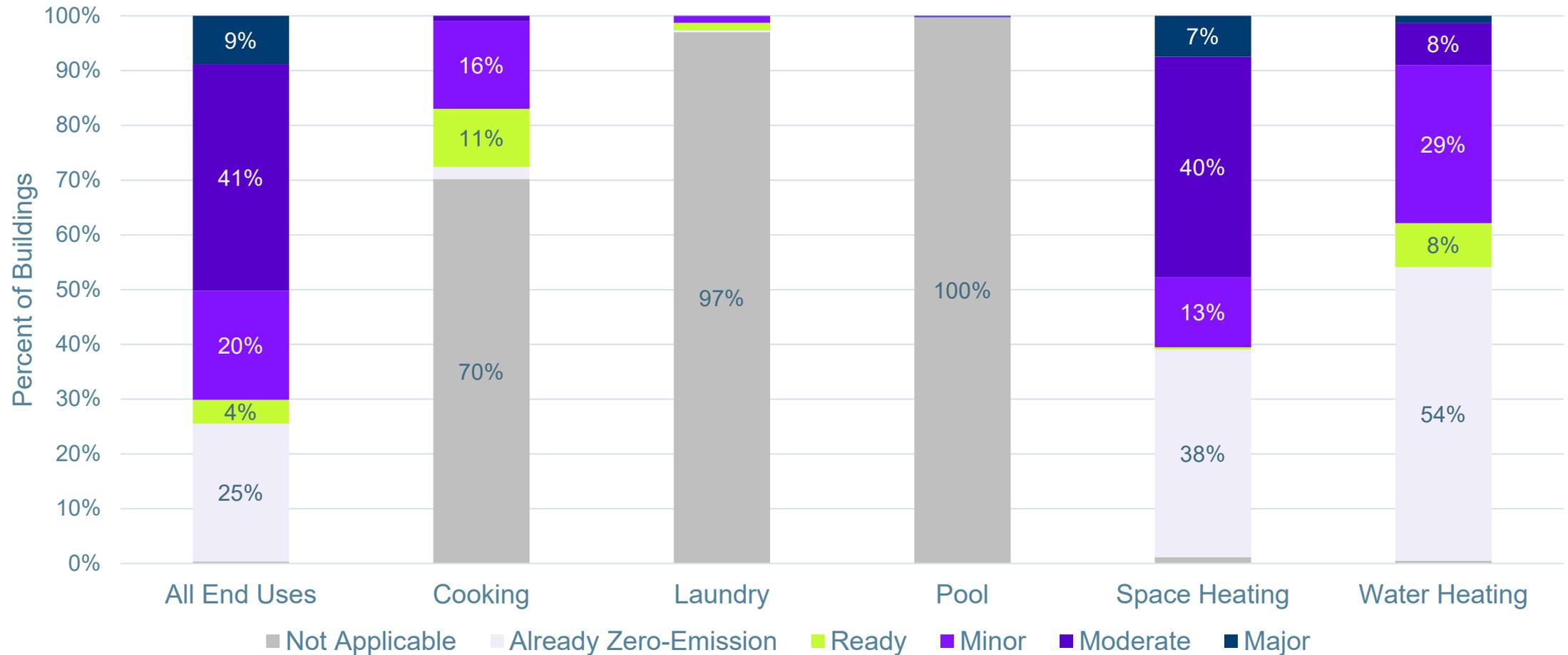
Schools
49%



Hotels
48%

Limited physical space is the main constraint.

Overall Building Readiness by End Use



Our Takeaway

- Two-thirds of California's nonresidential buildings will need upgrades before they can electrify.
- 25% are already zero-emission.
- 5% can electrify with no retrofit.
- Looking at systems jointly, not in isolation, changes the story.



Recommendations



What This Means for Clients

- Our analysis shows where electrification is straightforward and where hidden barriers exist:





Recommendations for Reducing Retrofit Needs

- ✓ Advocacy for and support **building codes that decarbonize existing buildings**, including state codes and local reach codes.
- ✓ Promote the manufacture of **packaged single zone heat pumps** exceeding 25 tons.
- ✓ Promote **Building Performance Standards**, which will require building owners to consider zero emissions technologies during major retrofits.

Thank You

Questions?

Also, feel free to contact me at bvarcin@trccompanies.com



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