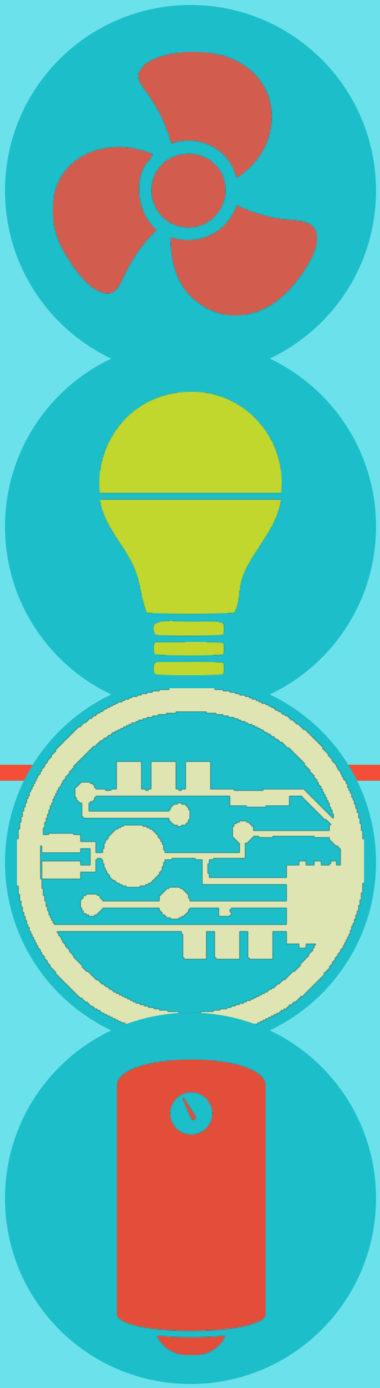
May 1, 2019

Momentum Savings Call


hello
MY NAME IS



Project Updates

JESSICA
AIONA

BONNIE
WATSON

Project Updates

Market	Project	Status	Lead
Nonresidential Lighting	Model Update	Finalizing results	Jessica Aiona
	Distributor Data Collection	Ongoing distributor outreach	
	OLSA Pilot	Wrapping up site visits	
Data Centers	Model Input Data Gathering	Scope development	
Residential HVAC	Model Development	Finalizing results	Bonnie Watson
	2016-2017 Sales Data Analysis	Finalizing results	
Commercial HVAC	Pilot Data Collection/Methods	Scope development	
Residential Hot Water	Model Development	Finalizing results	
	Market Characterization	Finalizing memo	

Contact Us

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AHR Expo Findings & Commercial HVAC Research

Goals for Attending AHR

- Identify key trends in commercial HVAC from the manufacturer perspective
  - Where is the market changing?
  - What is driving market change?
  - Where are momentum savings opportunities?
- Identify best opportunities to segment market for BPA momentum savings modeling purposes

Methodology

7 Manufacturer Interviews

3 Targeted Booth Visits

Partnership with Energy350

BSRIA Market Trends Session

Important Reminder

- Findings are based on statements from manufacturers interviewed at the AHR Expo
- Any numbers and percentages presented are anecdotal, unless otherwise cited.

Key Findings

Four Key Finding Areas

- Commercial HVAC market isn’t changing much
- Energy savings require a system level view
- VRF still most promising EE technology
- Components/controls offer efficiency opportunities

A (Mostly) Stagnant Market

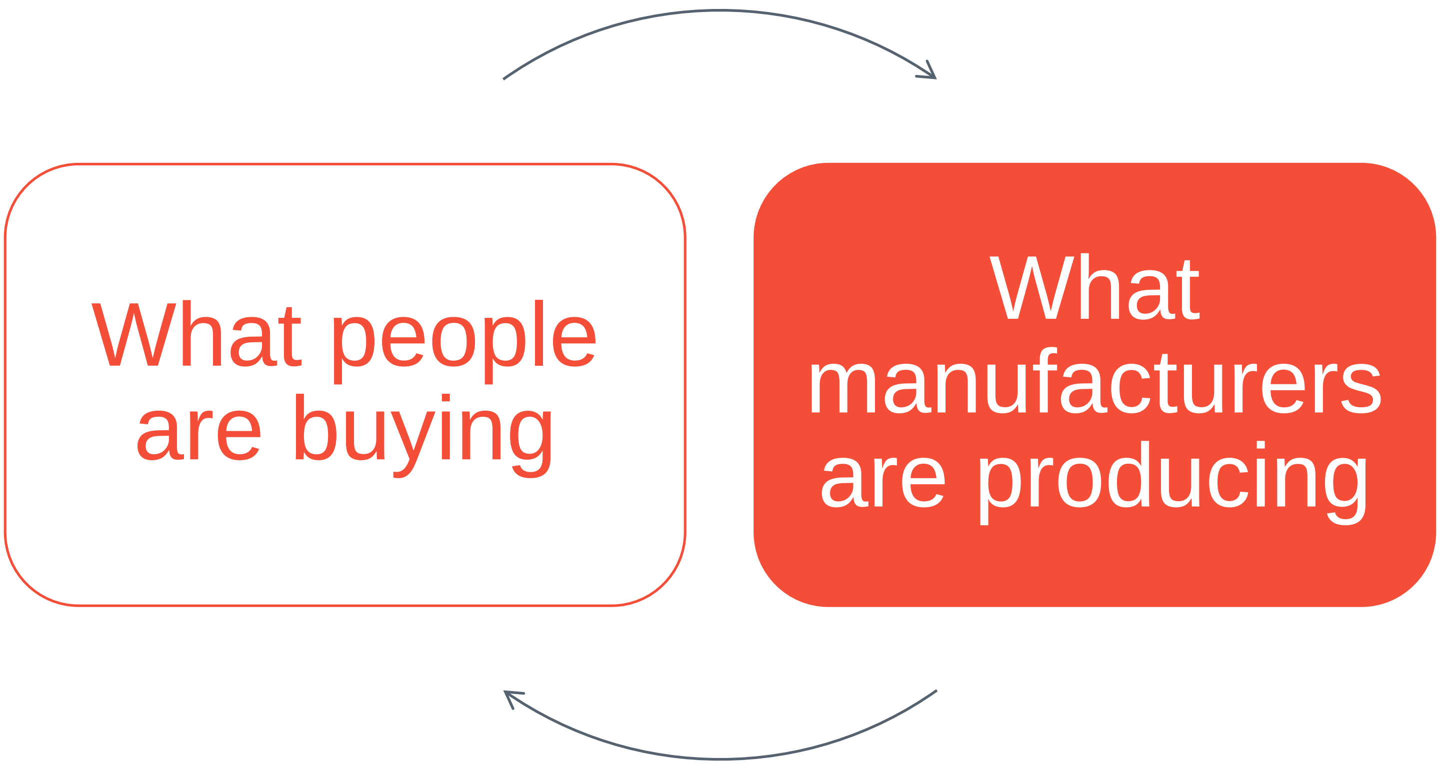
Commercial HVAC market isn't changing

Energy savings require a system level view

VRF still most promising EE technology

Components/controls offer efficiency opportunities

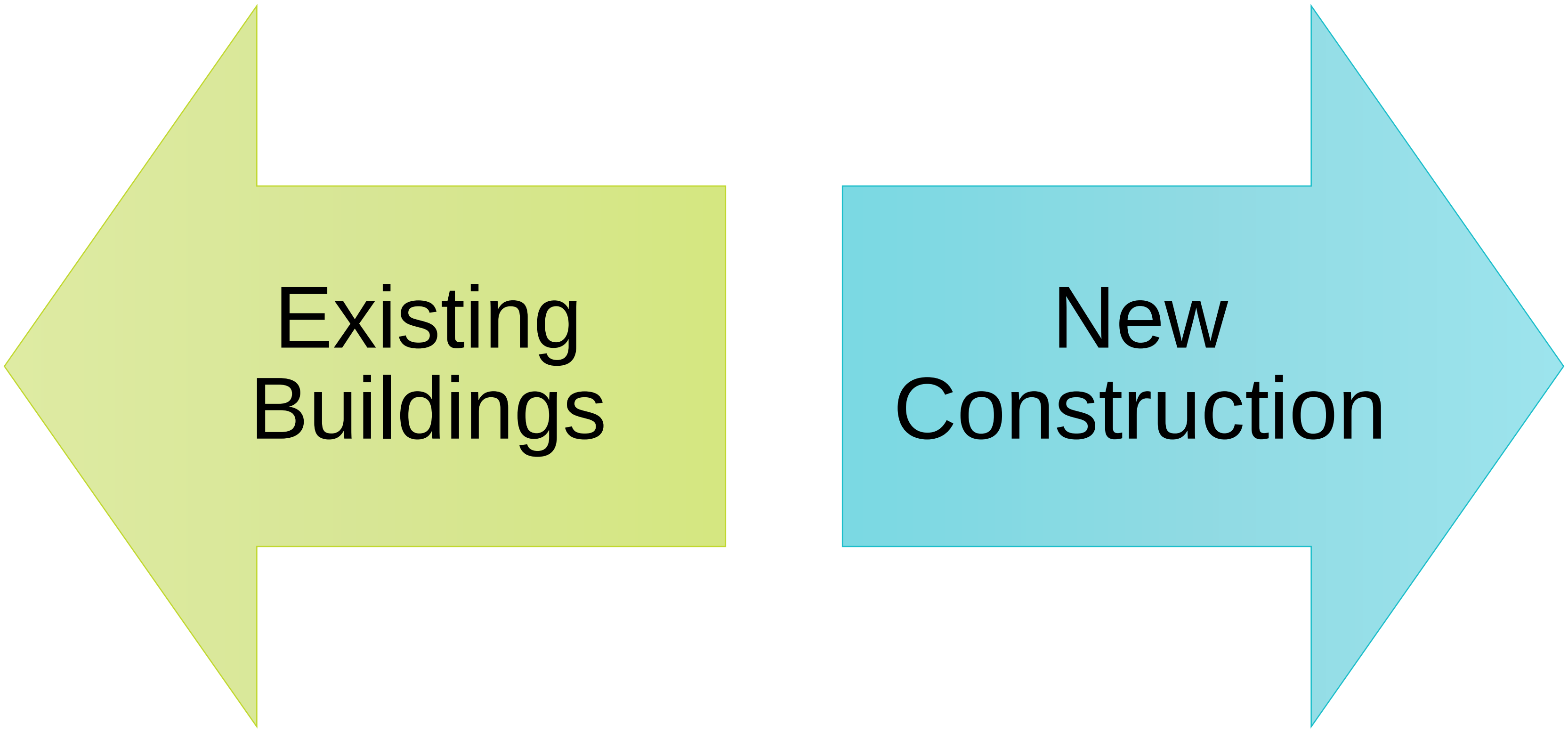
Limited Market Change



Unitary Isn't Going Away

- Dominating existing and NC markets
    - 35% in existing buildings (CBSA)
    - ~30–35% in new construction sales
- Gas/electric (~80%); HPs (~20%)

Really Two Separate Markets

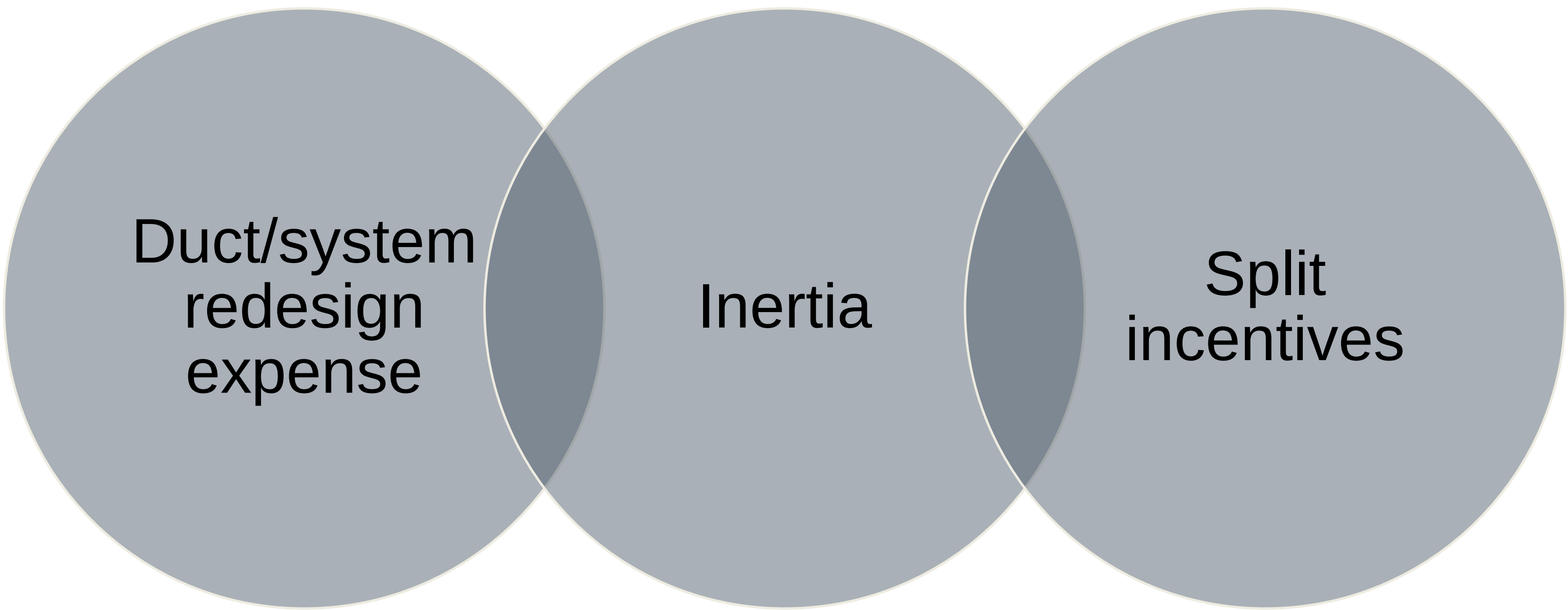


Existing Market is Stagnant

- The existing buildings market makes up 60–70% of the total market
- Manufacturers reported that from 40% up to 85% of replacements are like-for-like

> "Manufacturers are mostly focused on designing drop-in replacements for each others' units"

Why Isn’t it Changing?



New Construction Market Better… But Not Changing

Design around efficiency

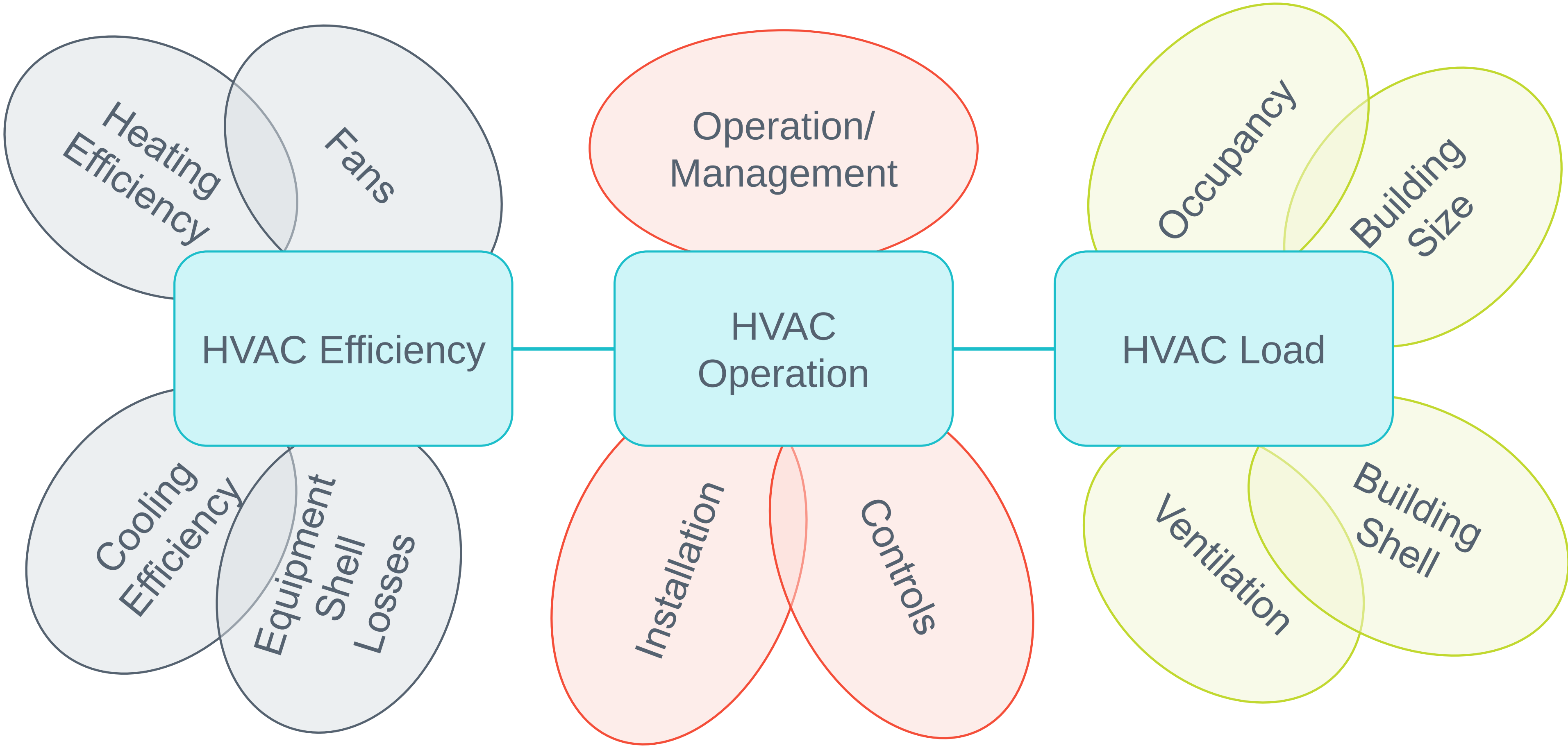
Codes drive building improvements

Trend towards bigger buildings could offset trends in efficiency

Where is There Energy Savings Potential?

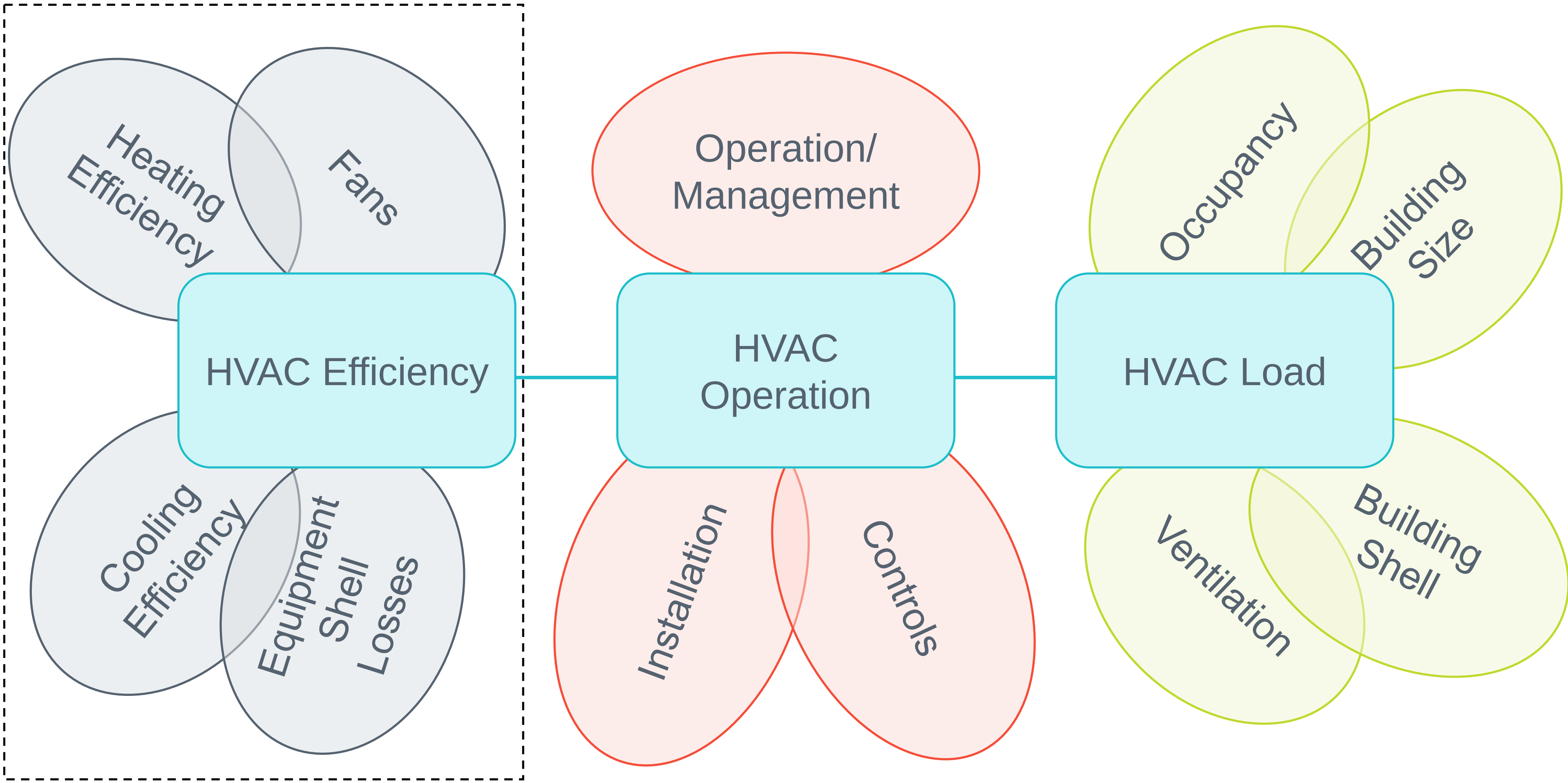
- Commercial HVAC market isn't changing
- **Energy savings require a system level view**
- VRF still most promising EE technology
- **Components/controls offer efficiency opportunities**

Drivers of Energy Consumption



Not an exhaustive list

Look First at HVAC Efficiency



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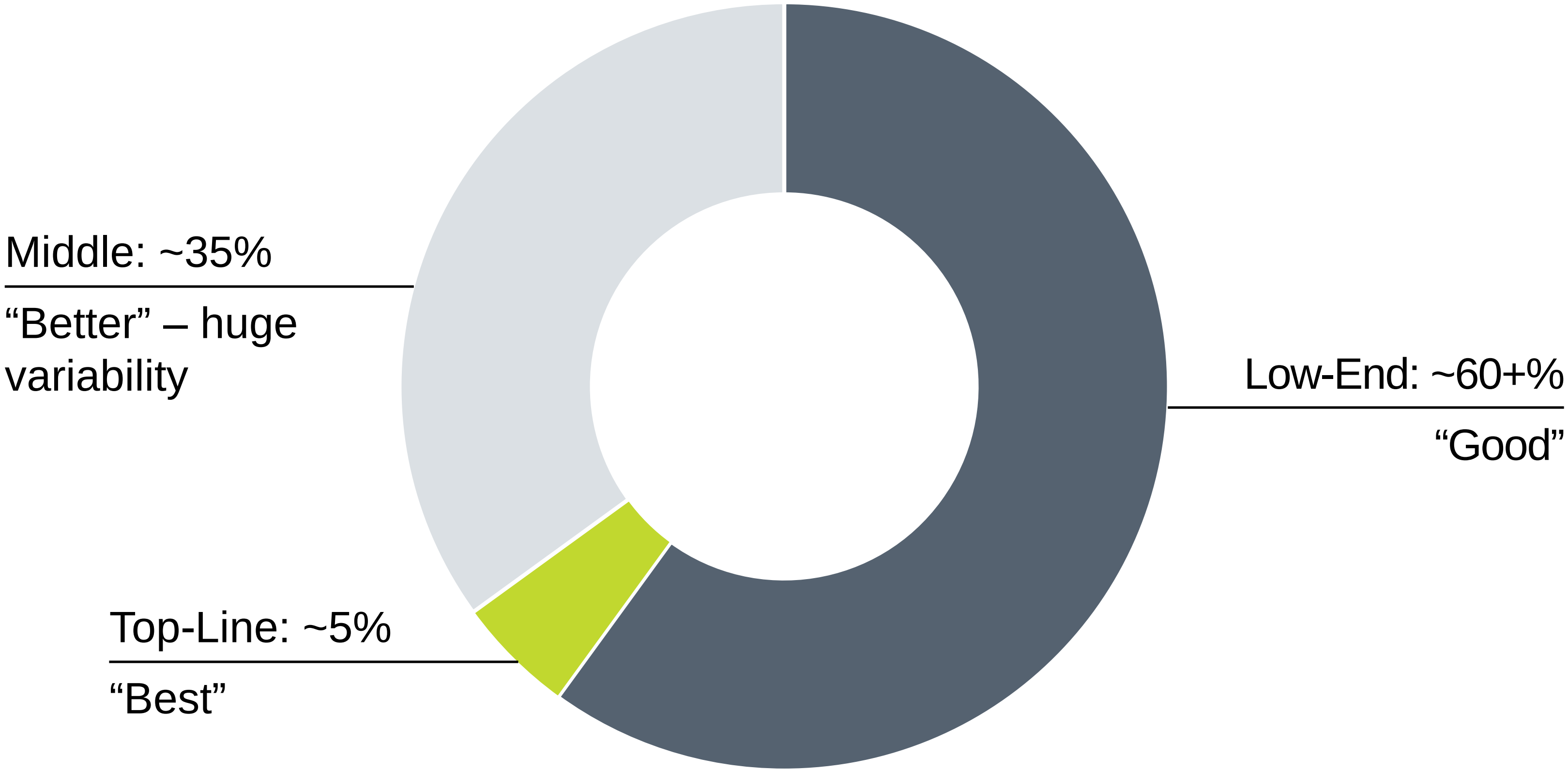
Two Ways to Consider Efficiency

Floor	Ceiling
• Driven by: Federal efficiency standard	• Driven by: Competition
• Motivation: Minimizing cost of system re-design	• Motivation: Improving brand reputation, appearing innovative/high end
• Market share: ~60+%	• Market share: ~5%

★ Potential opportunity to push existing stock towards high-end

Most Equipment Sales are Low-End

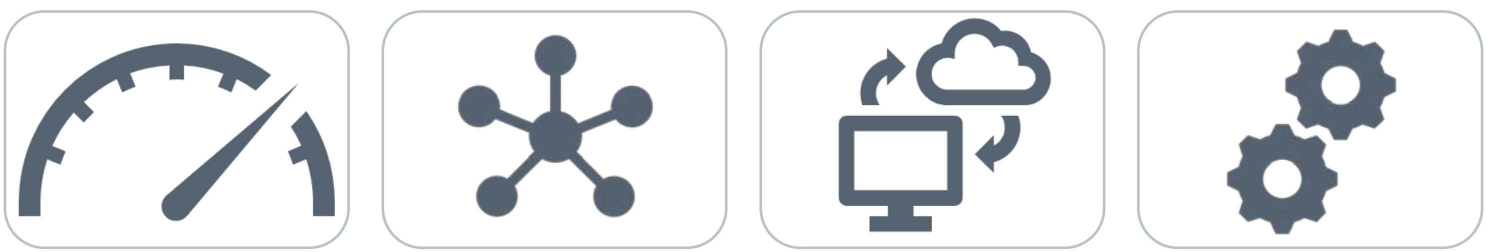


Standards Drive Low-End

Competition Drives High-End, but Uptake is Limited

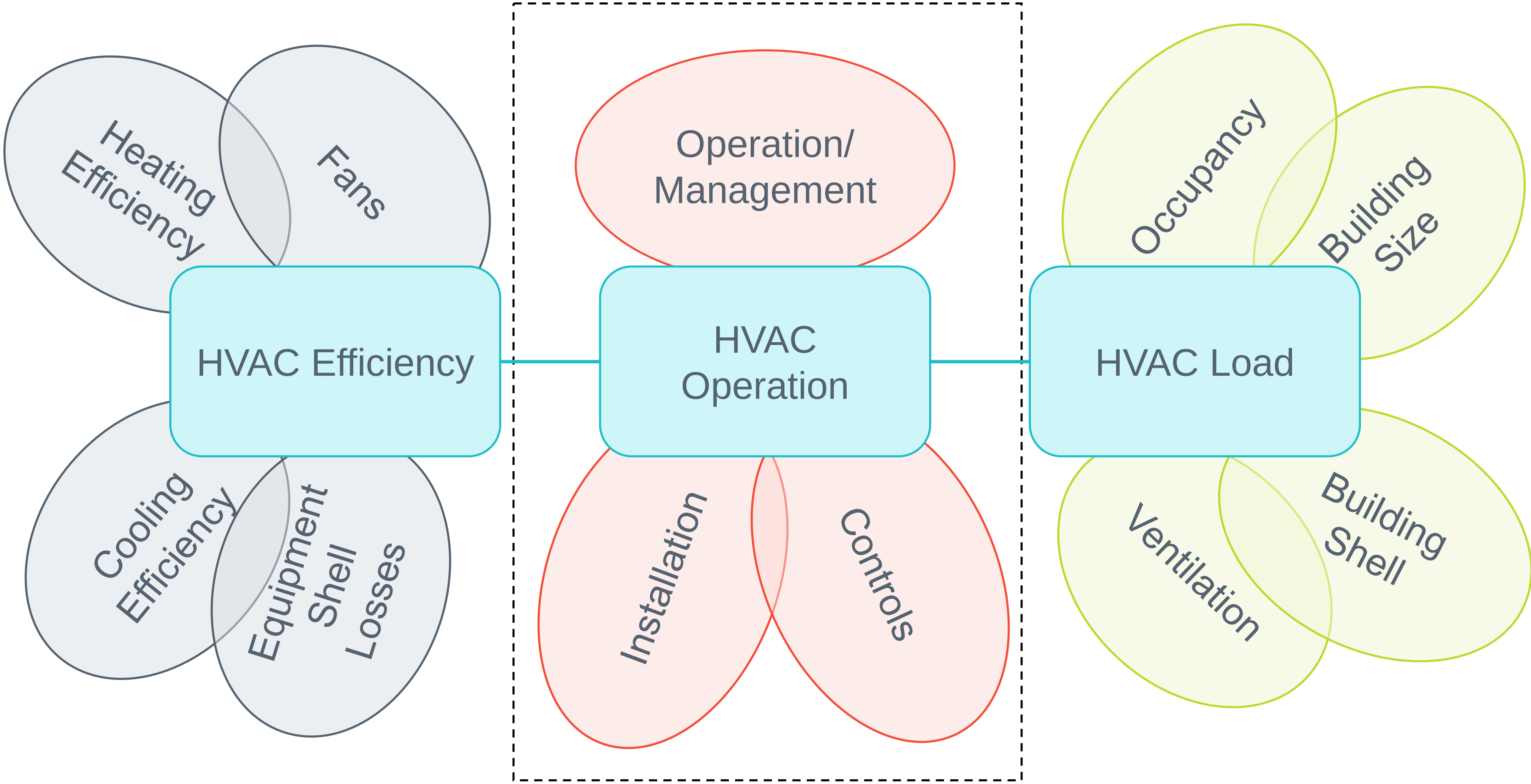
Manufacturers See Limited Efficiency Opportunities

- Manufacturers believe they are reaching the ceiling on equipment efficiency
  - Consistent with findings from the 2018 AHR Expo
- Future improvements will come from:



Operation **System Design** **Controls** **Components**

Now, Let's Consider Operation



Not an exhaustive list

Operation is Still a Problem

- “Most commercial HVAC equipment is not operating as intended”
- Or, installed incorrectly and has never operated as intended

Moving Toward Better Installation

- Newer technologies = higher standards

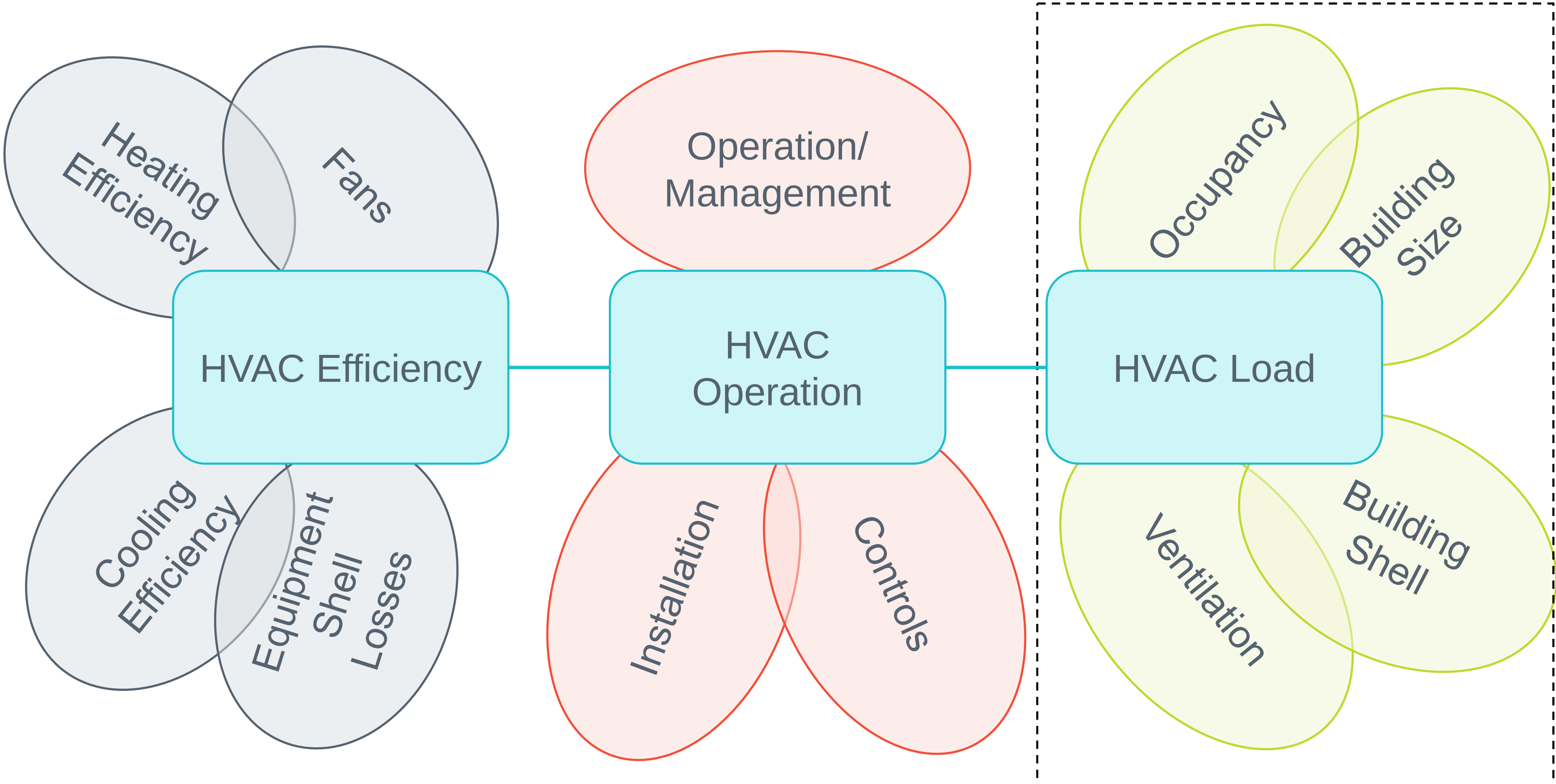
Unitary
- No training requirements

VRF
- Installer trainings
- Selection software

Controls
- Service contracts
- User trainings

★ Potential opportunity for operational improvement

Finally, Let's Look at HVAC Load



Not an exhaustive list

Several Ventilation Options, Different Efficiency Outcomes

Constant Volume

- Manual dampers cause over ventilation, wasted fan energy

Good

VAV

- Vary air volume based on building needs

Better

DOAS

- Decoupled air streams to deal to address ventilation separately

Best

What is DOAS?

DOAS

System

Provides decoupled ventilation from space heating and cooling

Equipment

RTU that can do 100% outside air and, potentially, humidification

Efficiency Opportunities

- VRF and system redesign
- Components driving efficiency
- Controls as a growth opportunity

VRF is the Next Big Thing… Still

- Commercial HVAC market isn't changing
- **Energy savings require a system level view**
- **VRF still most promising EE technology**
- **Components/controls offer efficiency opportunities**

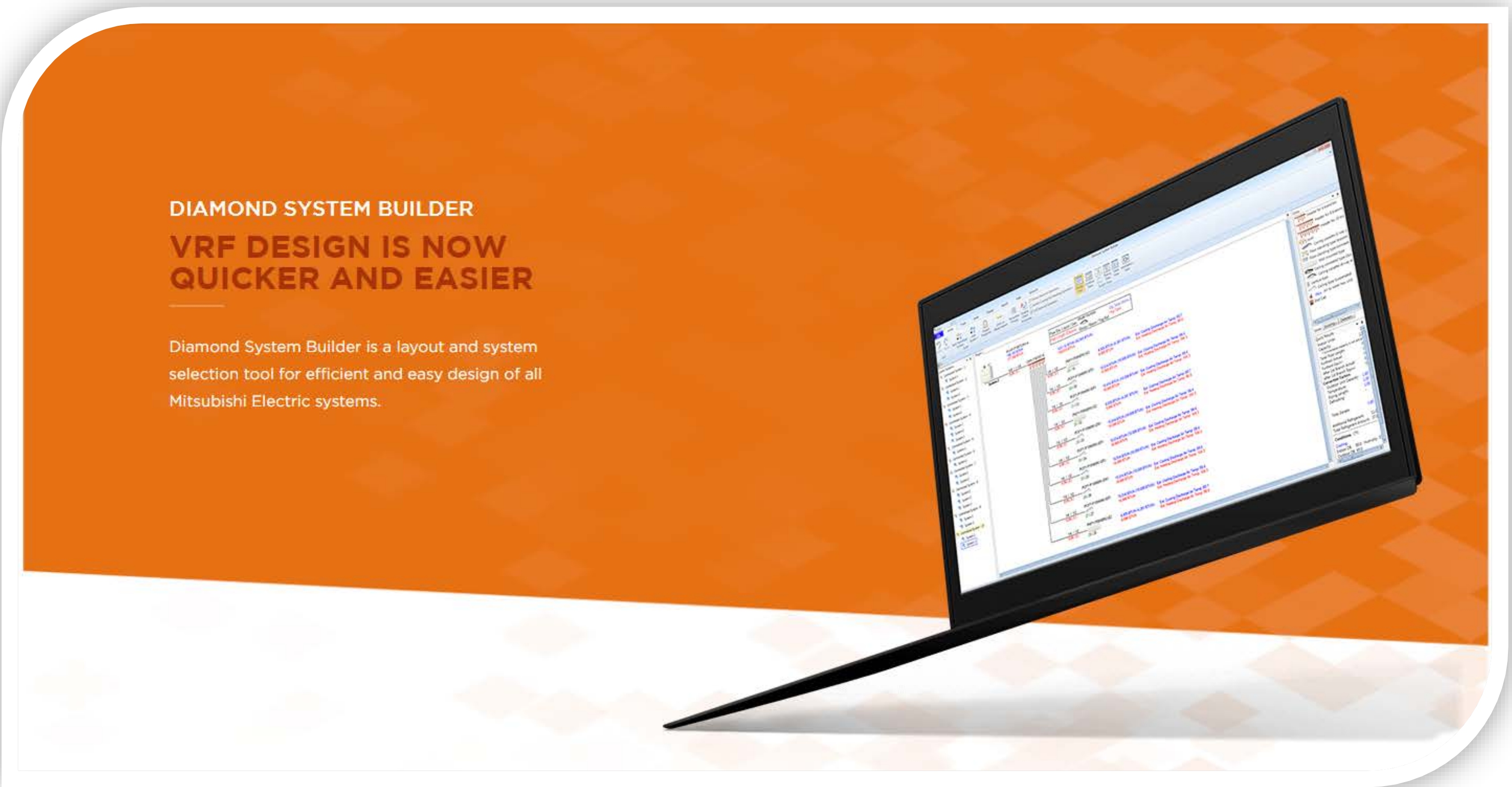
VRF Isn’t a Niche Market

- Double digit growth year over year, but in small market segment
- Starting to see mid-market pricing competition
- But, applications are limited

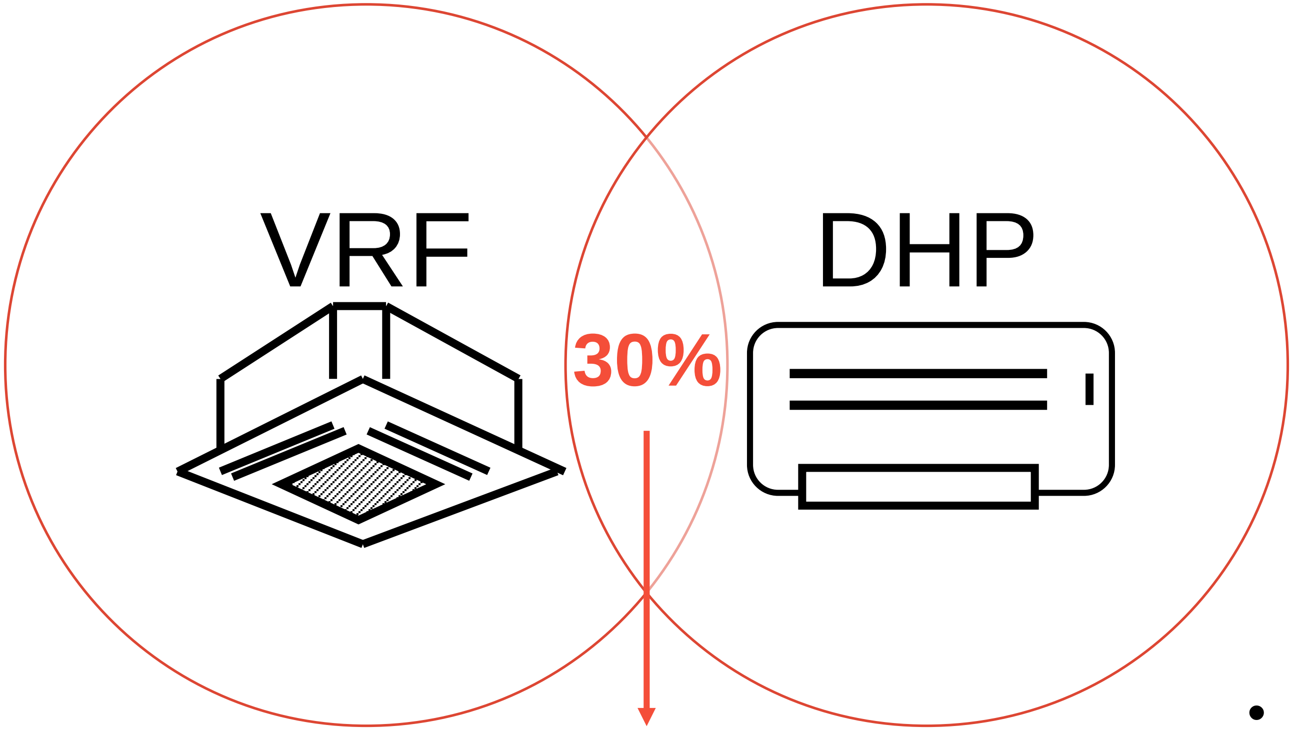
~75% of VRF sales in PNW are in new construction

~50% of new office buildings in PNW installed VRF

VRF Requires System Design



VRF versus DHP



- New construction
- Sophisticated, but expensive

~30% of jobs that could go VRF end up going DHP

- Retrofit
- Simple and cheap, but limited

Efficiency Opportunity Through Components and Controls

- Commercial HVAC market isn't changing
- **Energy savings require a system level view**
- VRF still most promising EE technology
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Components Driving Energy Efficiency

Economizers	HRV/ERV
	

Other: variable speed fans/compressors

Controls: Promising but Limited

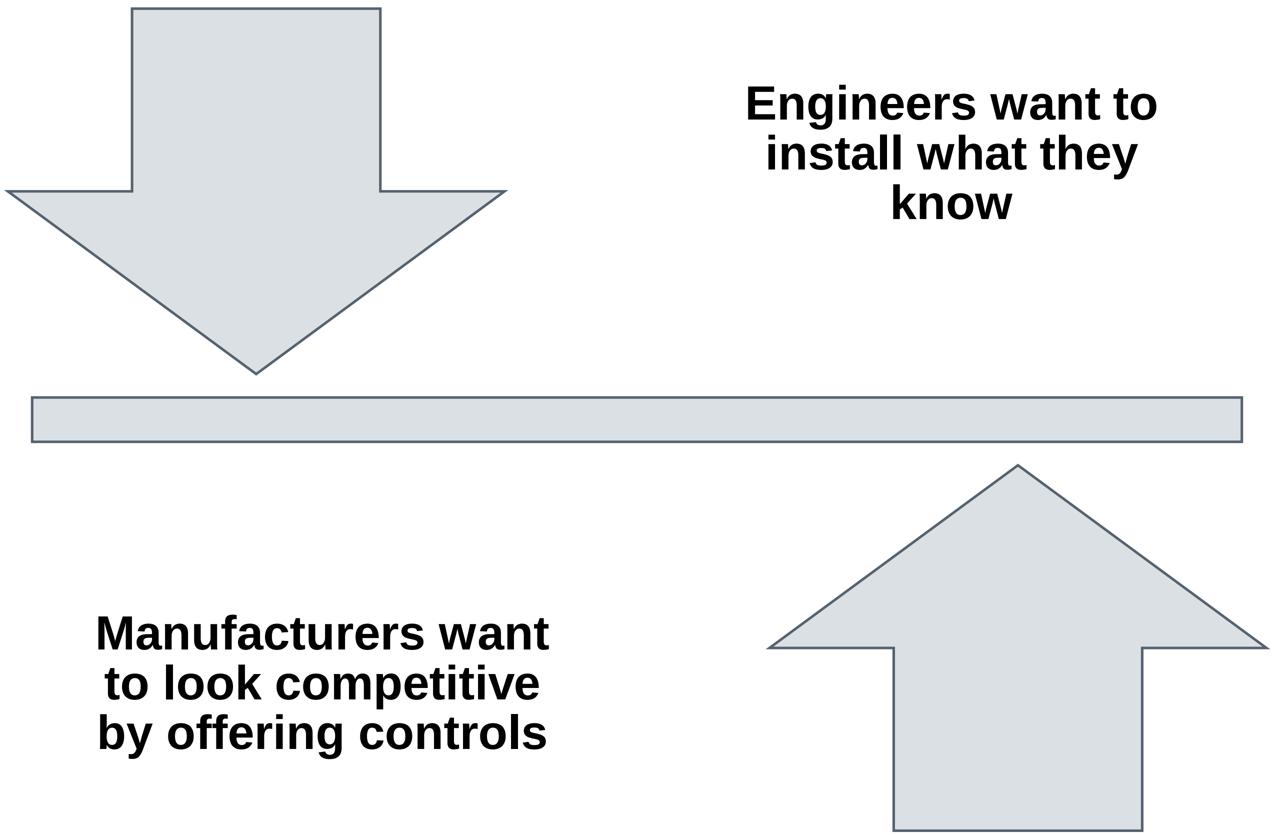
- Every manufacturer offers an integrated controls solution
- But, ~75% of buildings <50K don't have controls
  - ~70% of commercial buildings are this size

Lack of Owner Training

- Mis-managed/mis-operated/mis-installed
  - Losing out on energy savings
  - Happening across all systems at all efficiency levels

"It's no one's job to train owners on controls"

Market Inertia is Stifling Growth



Weak Use Cases for Controls

Two conflicting scenarios, neither mainstream:

Increased interest in data availability and visualizing system performance	Trend towards “servitization” and outsourced maintenance
↓	↓
Responsibility with the end user	**Responsibility with service contract holder**

What’s Next for BPA Momentum Savings

Preview of upcoming project

Task 1. Pilot Data Collection

- Determine if there is enough evidence of above-code, energy-saving commercial HVAC equipment installations in a sample of permit data such that it is worth continuing a full-scale permit data collection project.

★ Go/No-Go Decision

- Develop a process for full-scale permit data collection based on lessons learned from the pilot.

Task 2. Confirm Program Activity

- Confirm that regional VRF and DHP projects are not entirely driven by programs and/or building energy code.
- Understand how programs are estimating savings from such projects to inform methodology development.

★ Go/No-Go Decision

Task 3. Develop High-Level Methodology

Use the information and knowledge gained in Tasks 1 and 2 to develop a high-level method for quantifying momentum savings from above-code VRF and DHP (and potentially other) systems.

Timeline

- Begin work: June 2019
- Completion: Fall 2019

CONTACT

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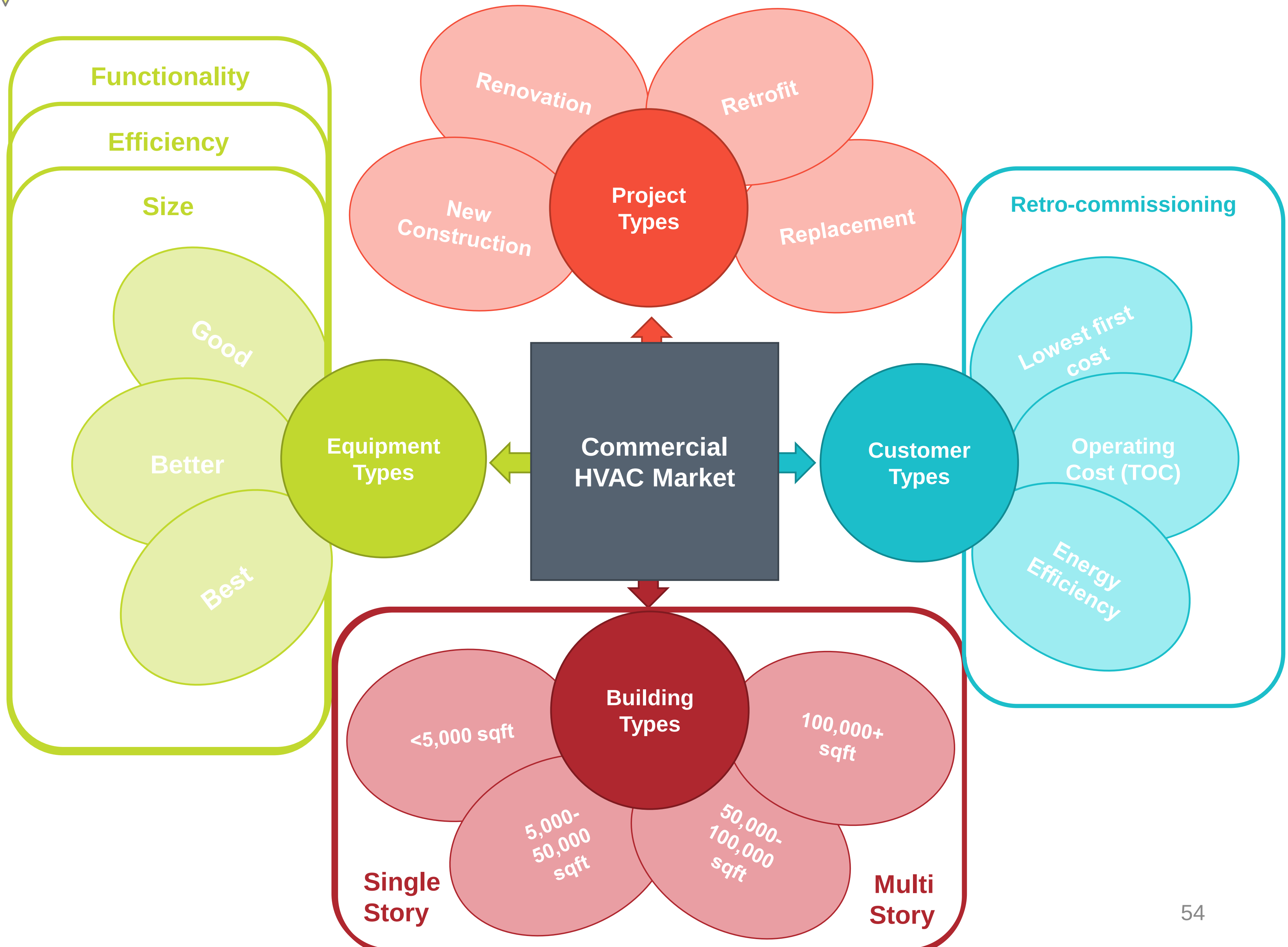
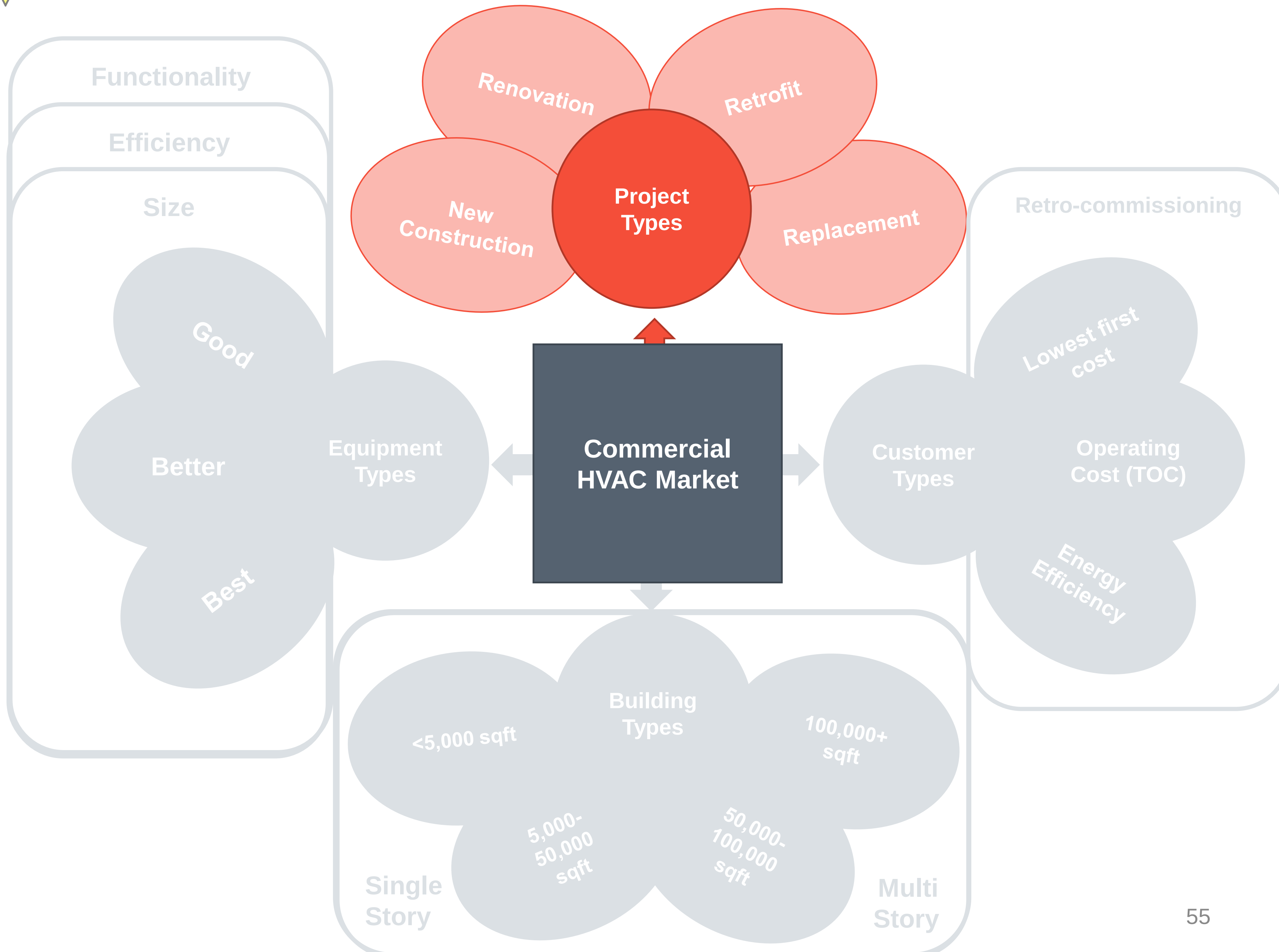
Appendix: Momentum Savings Modeling Market Segmentation

Understanding the Market… Where to Begin?

- Commercial HVAC is big → ~35% of commercial building energy use (EIA)
- It is diverse → high number of equipment types, component options, design options, and configurations
- So, developed a segmentation framework to narrow in on parts of the market that might be quantifiable for BPA modeling efforts



Commercial HVAC Market
Project Types
Renovation
Retrofit
New Construction
Replacement
Equipment Types
Functionality
Efficiency
Size
Good
Better
Best
Customer Types
Retro-commissioning
Lowest first cost
Operating Cost (TOC)
Energy Efficiency
Building Types
<5,000 sqft
5,000-50,000 sqft
50,000-100,000 sqft
100,000+ sqft
Single Story
Multi Story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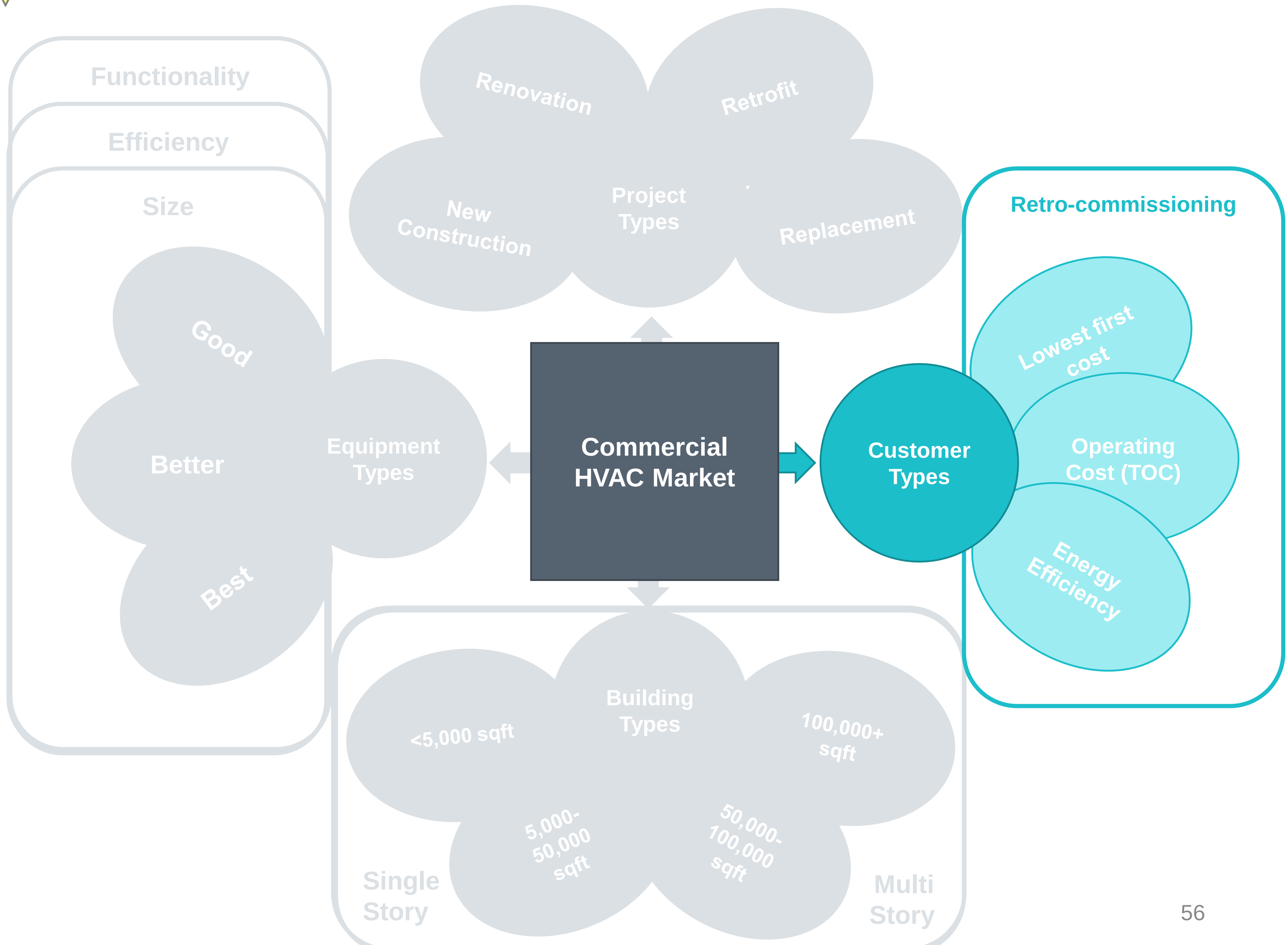

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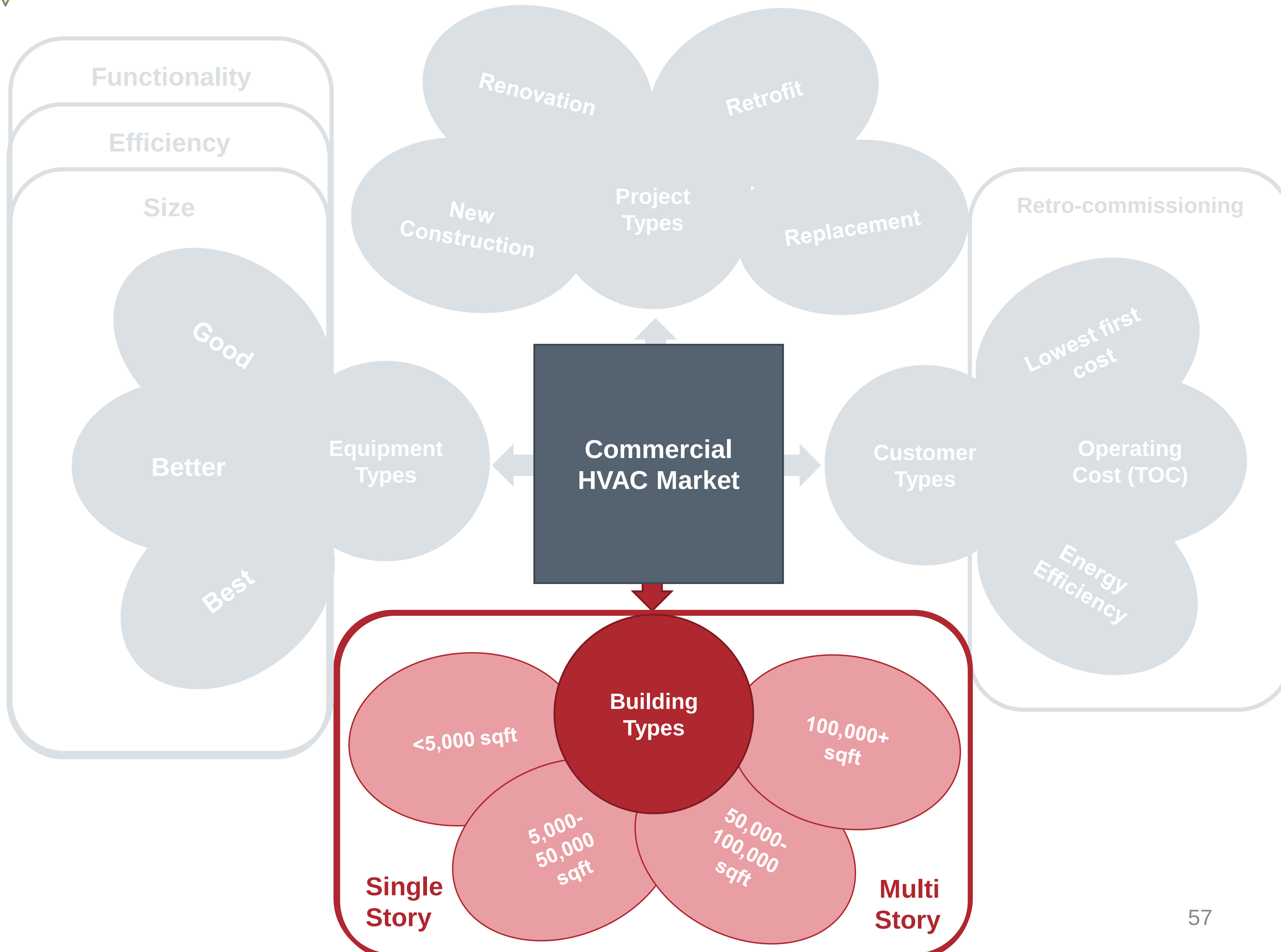
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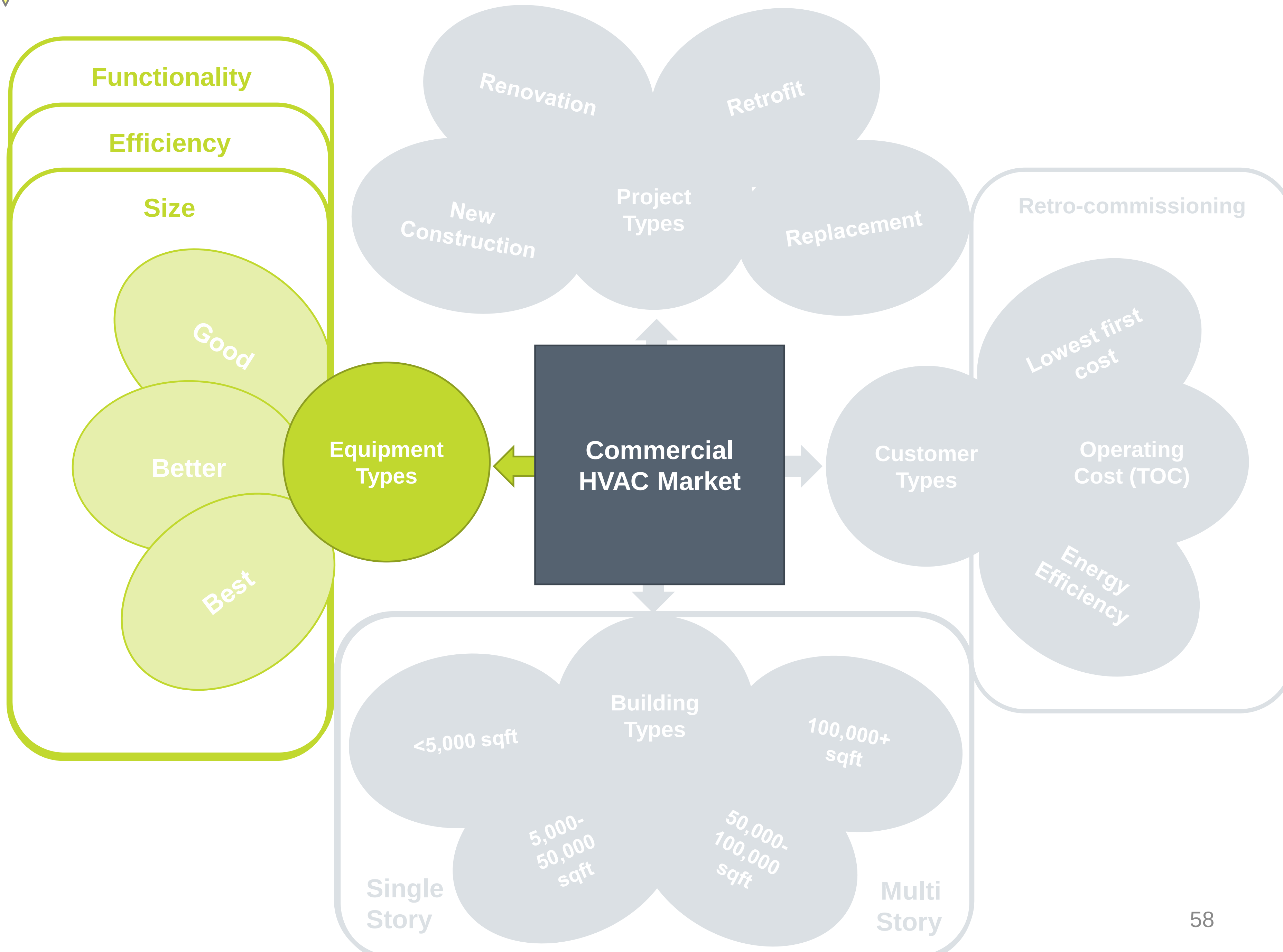
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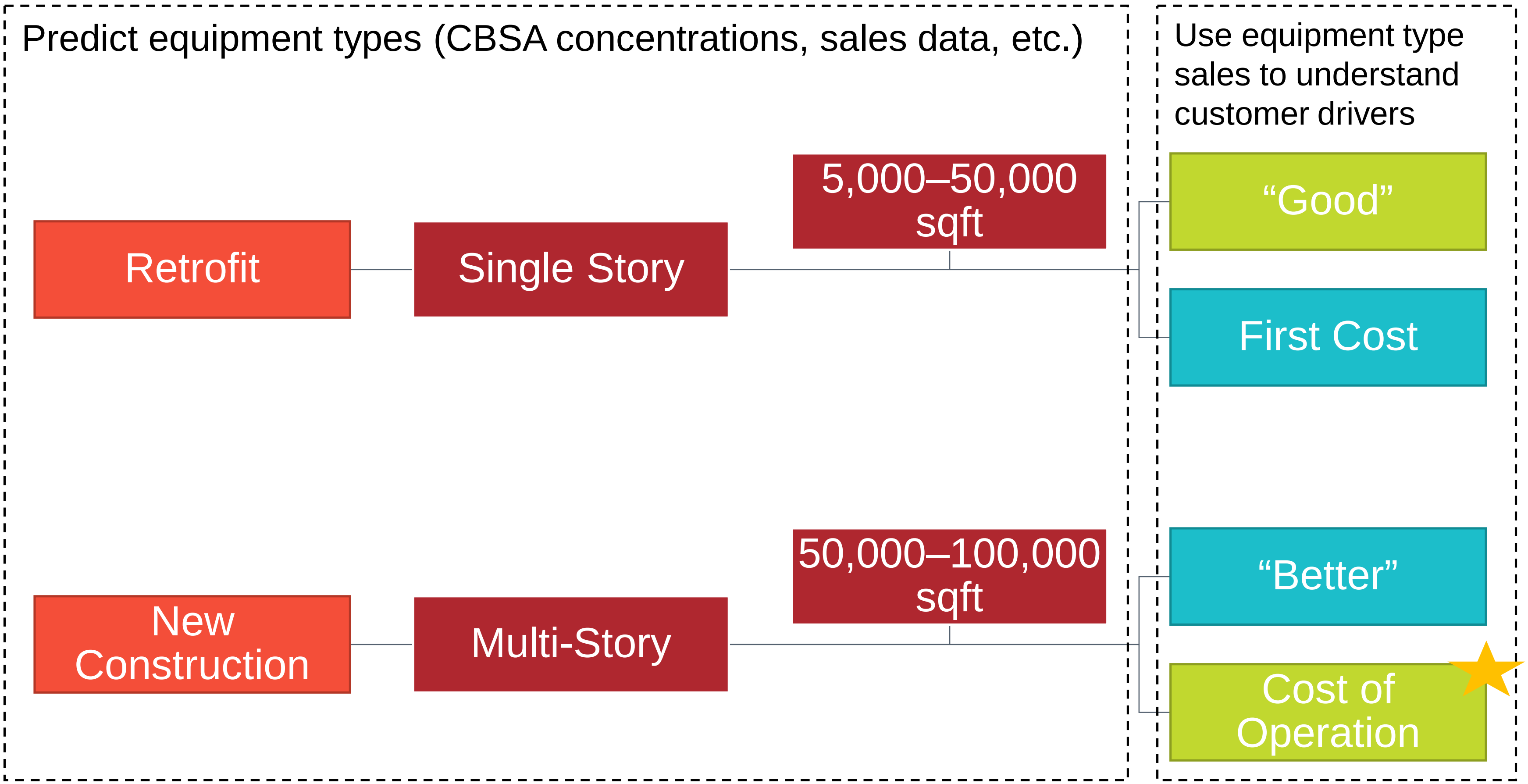
Layer Factors to Understand Market Drivers



★ Could be persuaded to purchase more efficient technology, represents savings opportunity

See you August 7, 9-10am!

www.bpa.gov/EE/Utility/
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