Taking Your Building's Pulse
Easy Metrics for Building Performance

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ENERGY STAR PARTNER

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Discussion Topics

- Commercial Building Demographics
- State of Building Performance
- Building Performance Improvement Process
- Case Study Example

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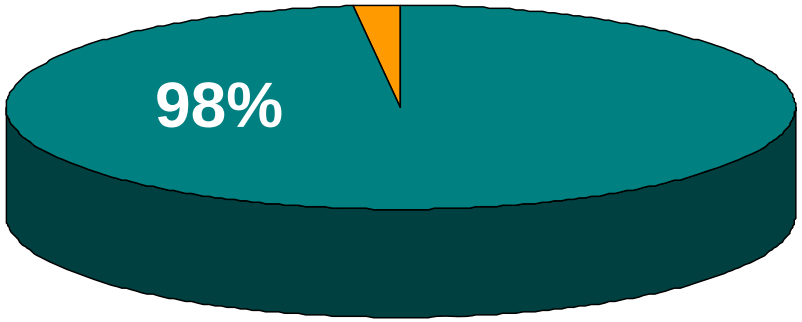
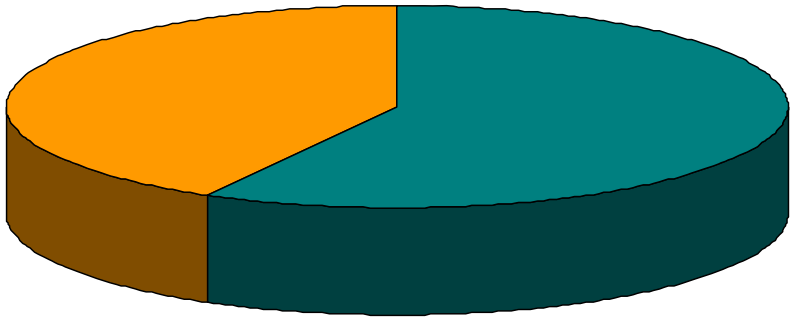
Building Demographics





98% of all buildings are less than 100,000 sq. ft.

Buildings less than 100,000 sq. ft. consume 58% of all the energy used in commercial buildings

Source: Energy Information Administration, *Commercial Building Energy Consumption Survey (CBECS),* Table C3, 2003.

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Where Does the Energy Go?

Schools and Office Buildings consume over 1/3 of all energy used in commercial buildings

Source: Energy Information Administration, *Commercial Building Energy Consumption Survey (CBECS),* Table C3, 2003.

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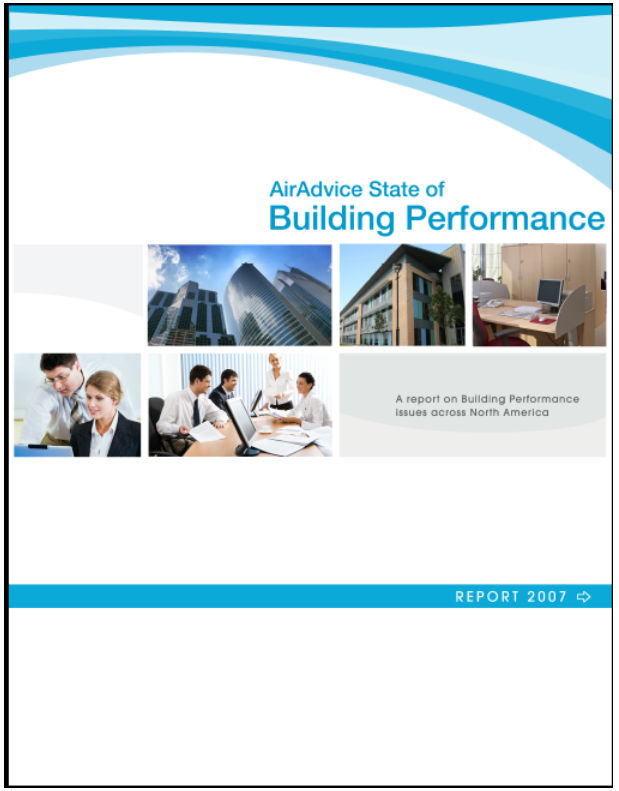
Building Performance Database

- Detailed analysis of 333 buildings
  - Temperature, humidity, carbon dioxide
  - Setpoints
  - Occupied / unoccupied periods
  - Outdoor temperature



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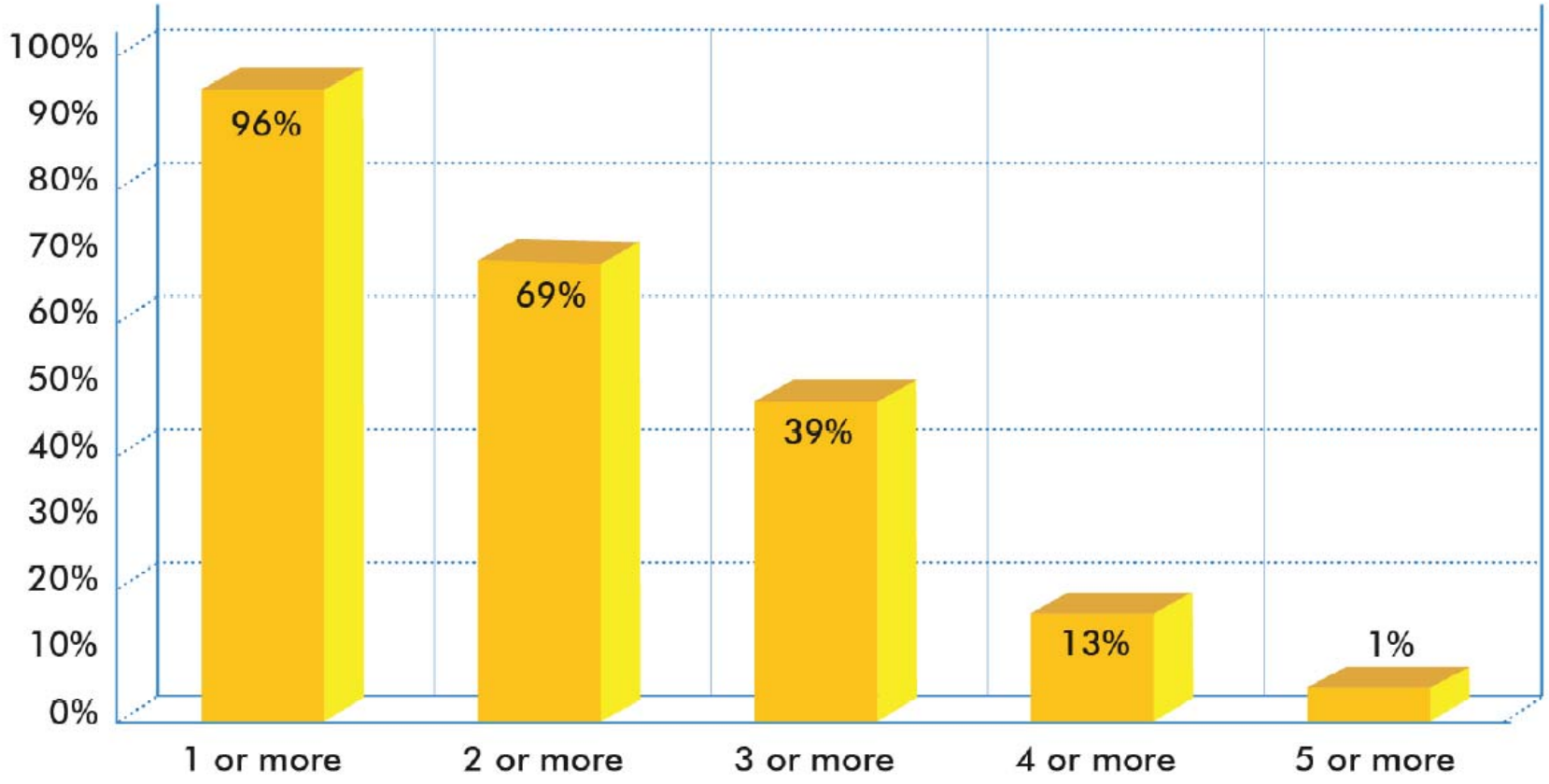
State of Building Performance



Nearly all buildings have issues

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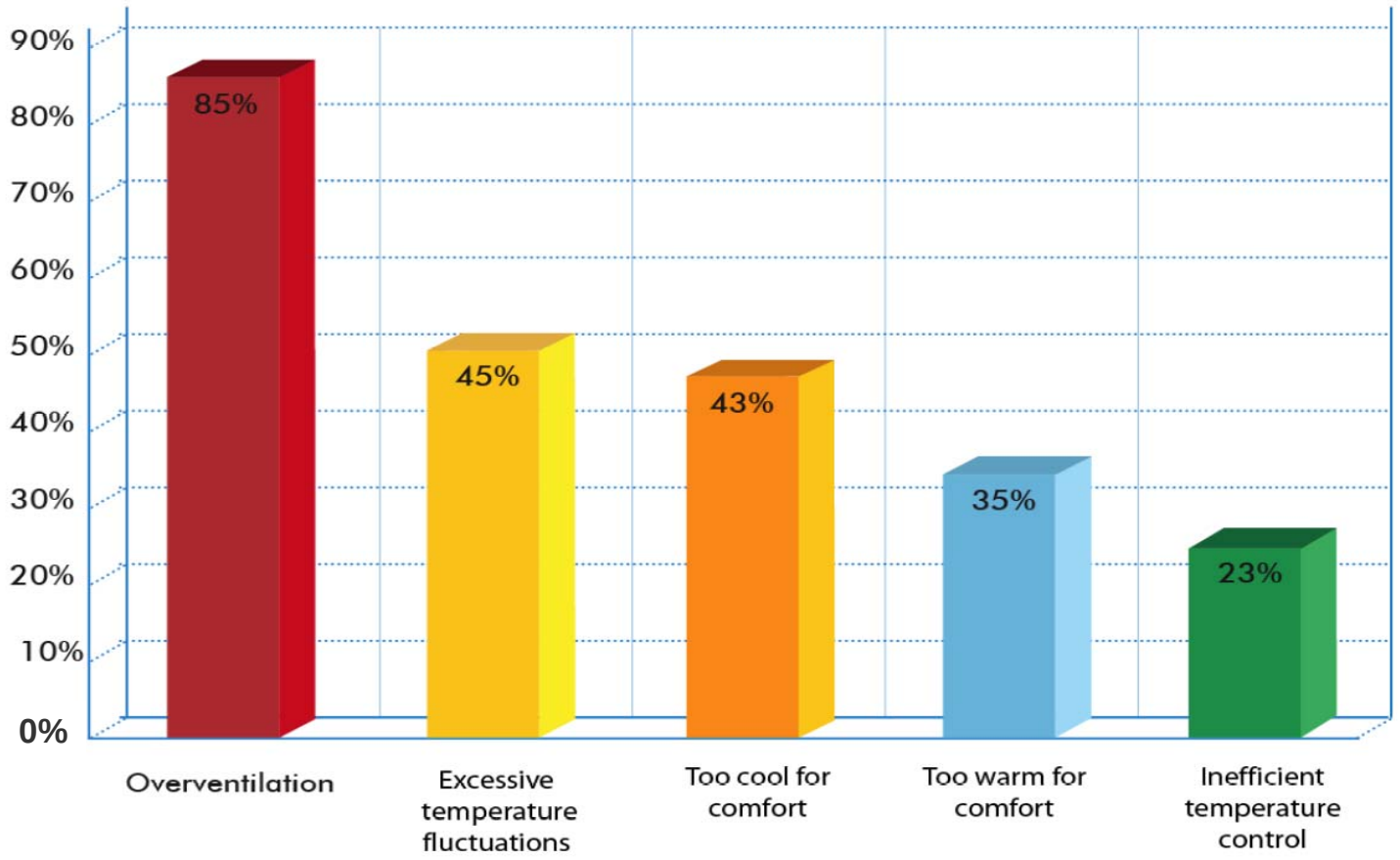
State of Building Performance



Overventilation most common issue

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Market Drivers for Energy Conservation

1. Rising Energy Costs

Who is Feeling the Pain?

Over 40% of the U.S. population is in states with higher than average electric rates AND recent increases

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Market Drivers for Energy Conservation

2. Utility Supply and Demand

Where Will Supply Come From?

Demand for electricity is projected to increase 41% by 2030.

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Market Drivers for Energy Conservation

3. Green / Sustainability

Going Green

Nearly half of companies report environmental reasons as equal or greater than cost savings when making investments in energy efficiency.

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What Have We Learned So Far…

- Base of existing buildings is large and fragmented
- Buildings are performing poorly
- End user demand for energy conservation is at an all-time high

How Do We Capitalize on This Market Opportunity?

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A New Perspective

"Just a couple of years ago, rent appreciation had a major impact on asset values. Operating costs were not at the top of a building owner's priority list. Times have changed! Today, as rent growth has slowed, reducing operating costs can have a significant impact on the value of a building. Energy efficiency has now become a priority."

- *Mark Fitkin, Managing Director, CB Richard Ellis*

"The easy money days are over. In the future, operating performance will be the key to producing returns."

- *Emerging Trends in Real Estate, PricewaterhouseCoopers*

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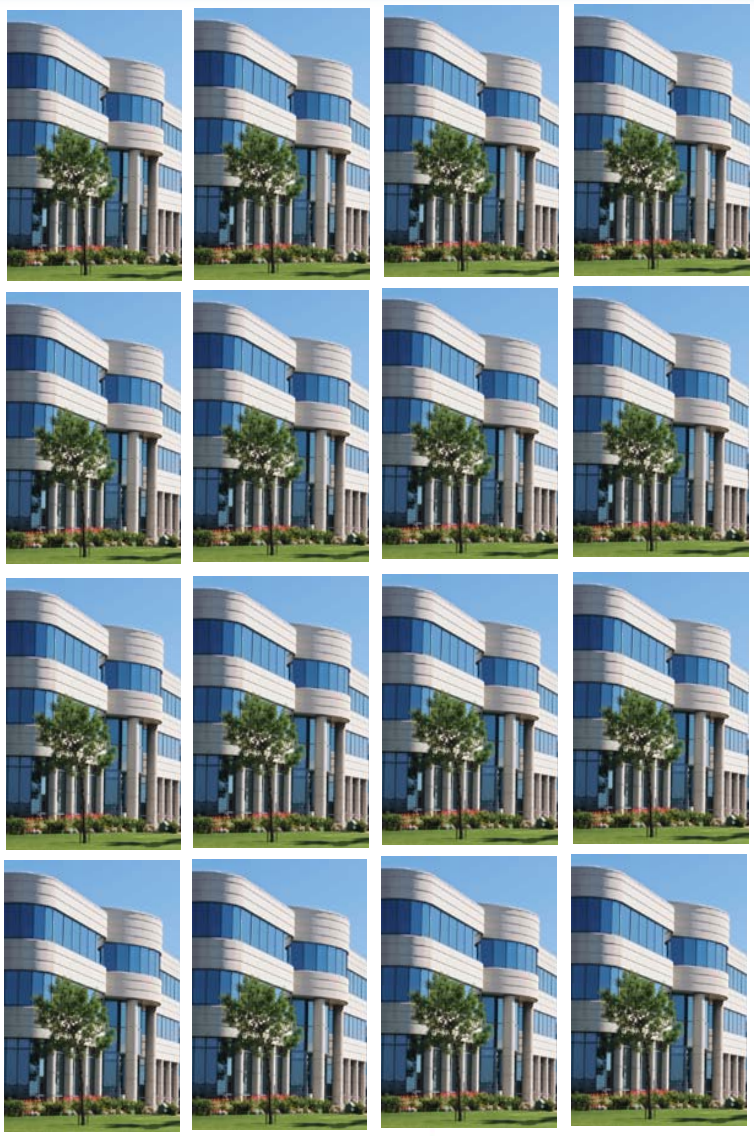
Enable Scale!

VS.



Critical Success Factors to Enable Scale

1. Manage Labor Content
   - Can we scope projects in less than 4 hours?
2. Minimize Level of Expertise Required
   - Can we utilize junior engineers and technicians?
3. Smart Trade-offs
   - Can we deliver 80% of the value for 10% of the cost?

What are the barriers to achieving scale?

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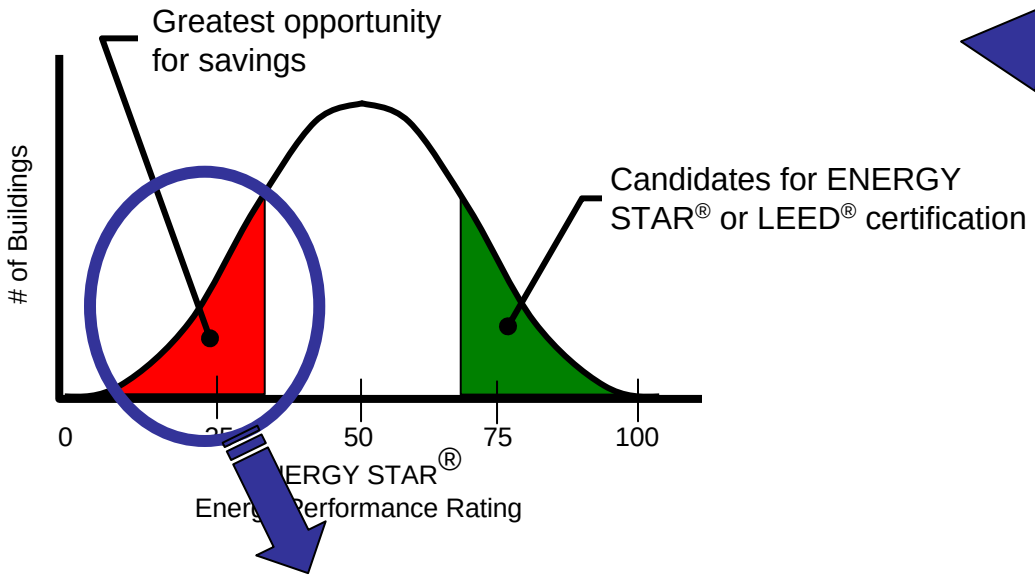
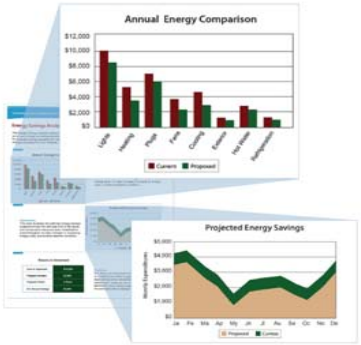
Process to Save Energy

1. Benchmark Portfolio



2. On-site Energy Survey



3. Implementation
   - Low / no cost
   - Capital

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Benchmarking Metrics

1. ENERGY STAR® Energy Performance Rating
2. Energy Cost per square foot ($ / sq. ft.)
3. Energy Usage Index (kbtu / sq. ft.)
4. Carbon Footprint (lbs CO_2 / sq. ft)

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Benchmarking Metrics

	Normalizes For:				
Metric	Size	Use Type	Occupancy	Weather	Site / Source
ENERGY STAR® Rating	Yes	Yes	Yes	Yes	Source
Energy Cost ($ / sq. ft.)	Yes	No	No	No	Site
Energy Usage Index (kbtu / sq. ft.)	Yes	No	No	No	Site
Carbon Footprint (lbs CO_2 / sq. ft.)	Yes	No	No	No	Source

ENERGY STAR® Rating normalizes for the most variables

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On-Site Energy Survey

Why Aren't More Energy Audits Done?

1. High labor content to qualify opportunity
2. Available tools cumbersome
3. Analysis and reporting slow and tedious

Cost of sale is high with no guarantee of success

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Emerging Technologies Address Challenges

1. Wireless sensor networks / cellular data communications
   - Reduces labor requirements
   - No wires!
   - Eliminates need for interface to IT infrastructure

Optimize use of engineering time

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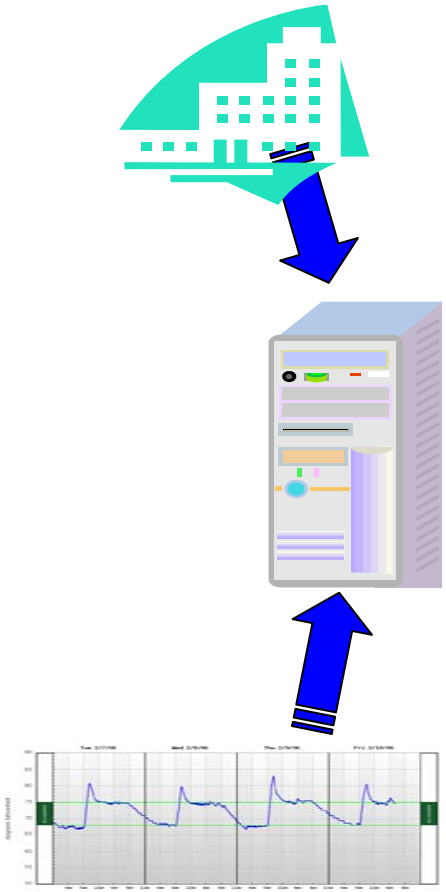
Emerging Technologies Address Challenges

2. Practical energy modeling
   - Takes advantage of actual history to reduce complexity and improve accuracy
     - Utility bills
     - Weather
     - Actual environmental conditions
   - Far less labor to capture and input data



Optimize use of engineering time

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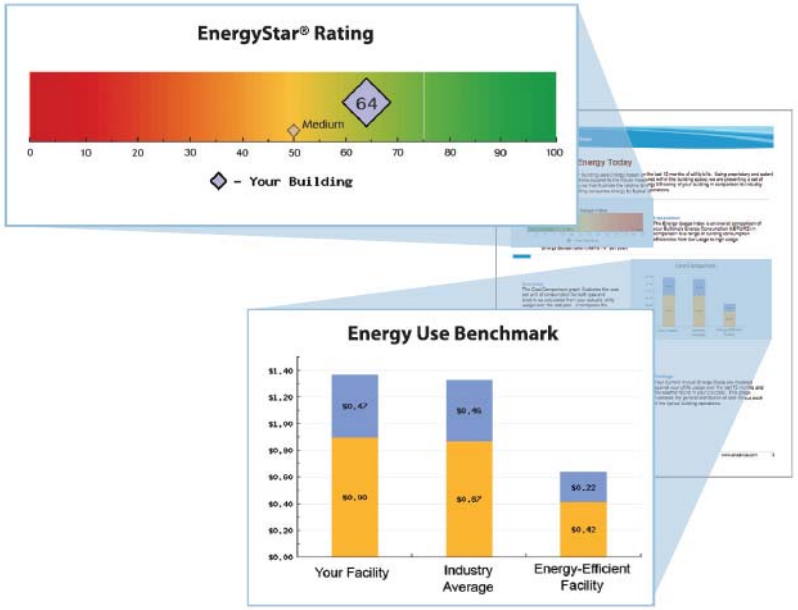
Emerging Technologies Address Challenges

3. Automated analysis & reporting
   - Reduces labor required to analyze results
   - Produces necessary documentation for all levels of decision-making
     - Executive
       - Portfolio ranking
     - Financial
       - Return on investment
     - Technical
       - Energy conservation measures and system enhancements



Optimize use of engineering time

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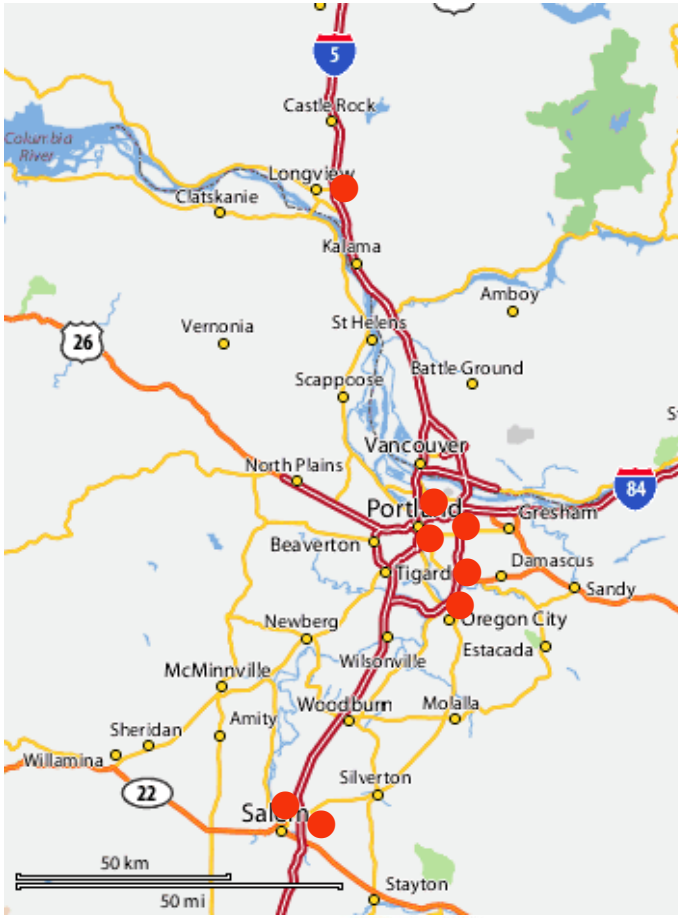
Case Study

Large health care provider with operations in 10 states contracted through their HVAC service provider to audit the energy performance of 8 medical office facilities in and around Portland, OR

- Buildings have nearly identical functions
- 549,000 total sq. ft.
  - Buildings ranged from 50,000 to 100,000 sq. ft.
- $1.2 million annual energy spend



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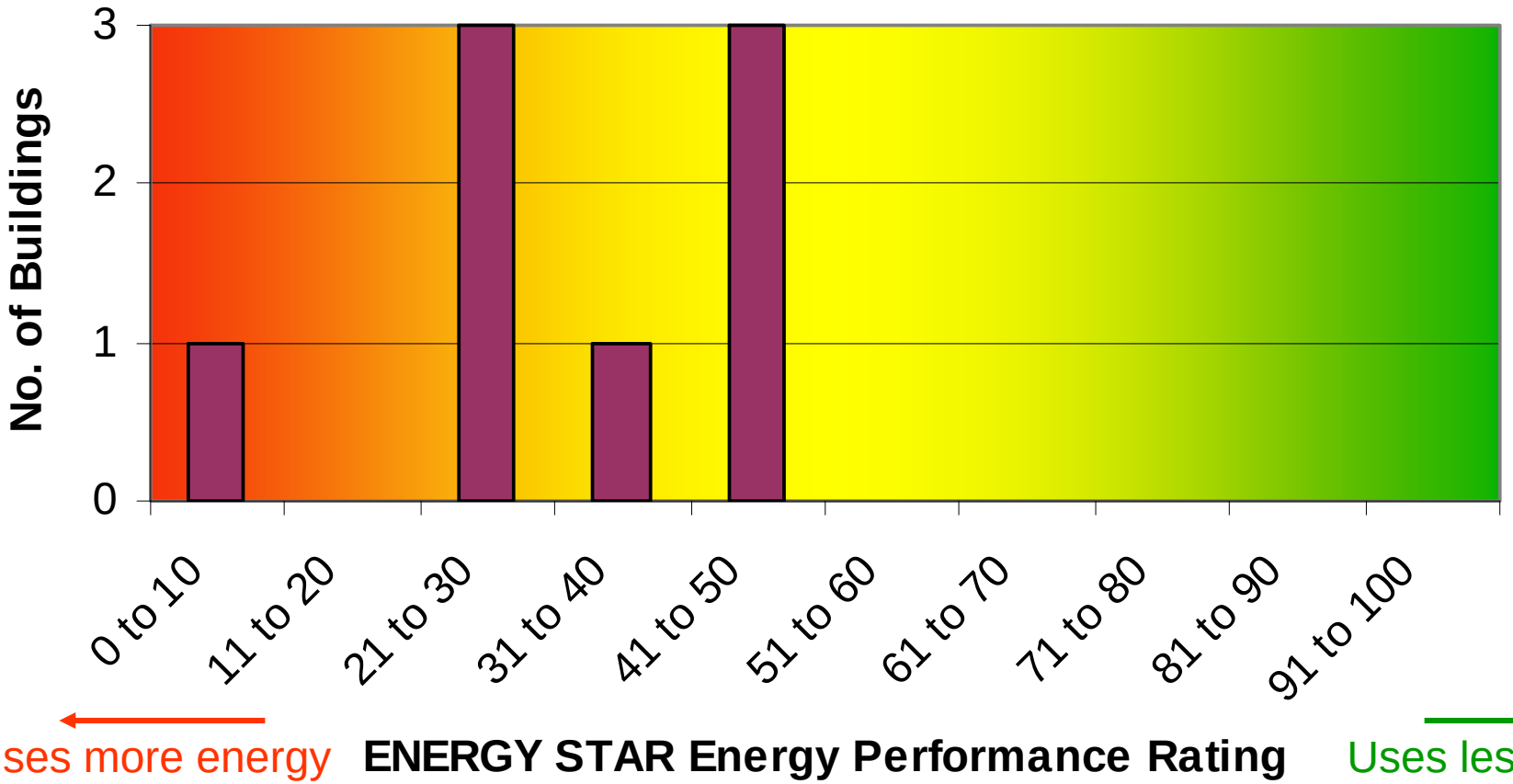
Benchmark Portfolio



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Benchmark Portfolio

Rank	Bldg ID	Energy Star Rating	Energy Cost $/ft2	EUI kbtu/ft2	Carbon lbs/ft2
1	B	49	$ 2.13	113.9	24.3
2	H	48	$ 2.20	116.5	26.1
3	G	42	$ 1.96	105.1	22.9
4	C	36	$ 1.63	82.3	21.2
5	D	26	$ 2.50	155.0	29.8
6	A	24	$ 2.01	90.0	24.7
7	E	22	$ 1.76	109.8	24.1
8	F	7	$ 2.51	139.6	29.9

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On-Site Energy Survey

- Most common issues found:
  - Equipment / lights on during unoccupied periods
  - Simultaneous heating and cooling
  - Poor ventilation control → over-ventilation

Energy Savings Potential

	Current ($k)	Proposed ($k)	Savings ($k)	Savings (%)	Savings ($/ft²)
Electricity	$898.3	$844.4	$53.9	6%	$0.10
Gas	$261.9	$102.9	$159.0	61%	$0.29
Total	$1,160.2	$946.5	$212.9	18%	$0.39

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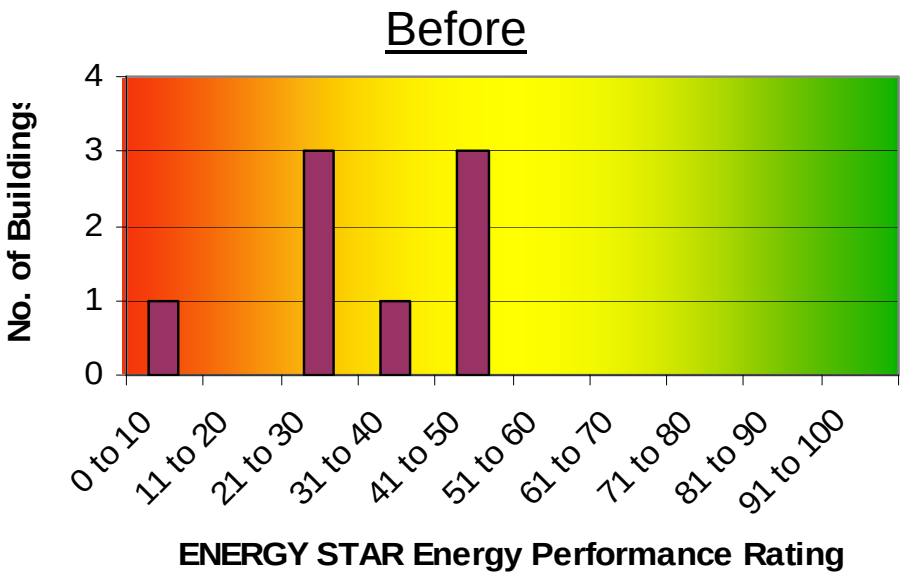
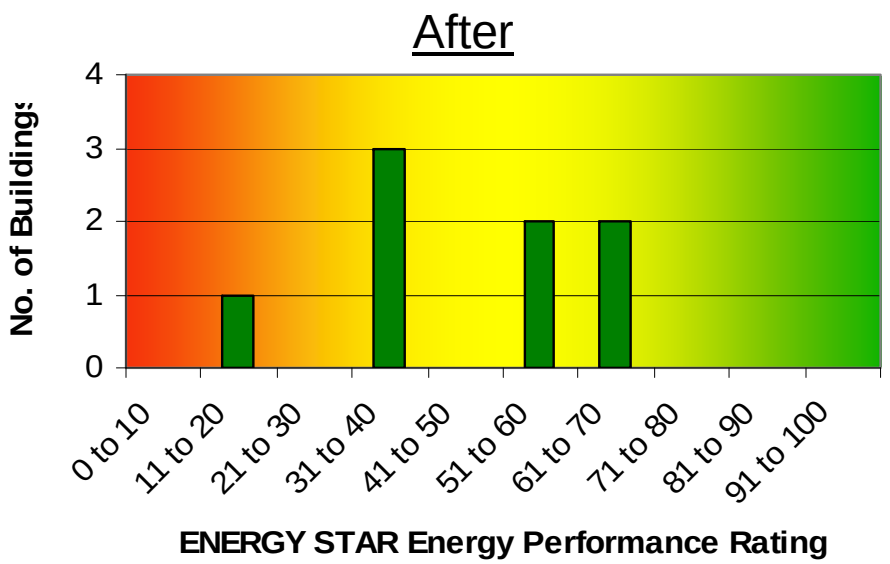
Improvement in ENERGY STAR Rating





Average ENERGY STAR Rating Increased 13 Points

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Summary and Conclusions

1. Tremendous opportunity for improving comfort and energy efficiency in existing buildings
2. Large, fragmented stock of buildings will require new methods to achieve a real impact
3. Define a scaleable process
   - Leverages automation in data collection and reporting
   - Reduces labor
4. Use Metrics & Benchmarking to track Sustainable efforts

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