Whole Building Energy Performance

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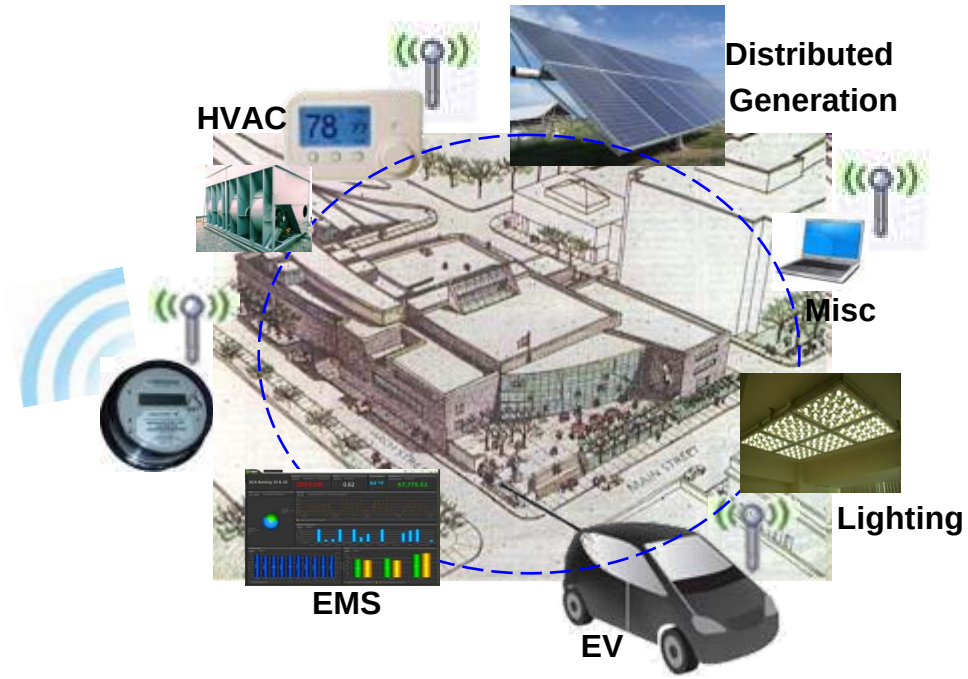
Convergence of EE in Buildings

Since 1976, PG&E's energy efficiency programs have:

- **Saved 155 million MWh and 12.5 billion therms**
- **Helped California avoid building 24 large power plants**
- **Avoided 155 million tons of $C0_2$ emissions**
- **Saved customers over $24 billion**

Most savings on 'Individual Measure' based savings yet industry mega-trend is Integration



CA Regulatory Context: Whole Building Energy Efficiency

Regulatory Drivers

- **Whole Building Goals & Vision**
  - AB 1103, SB 758
  - CA Title 24, Green Building Code
  - EE Long Term Strategic Plan
  - Local Government Programs

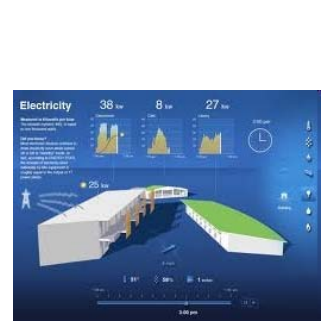
Regulatory Challenges

- **Widget Focused Savings Claims Methodology**
  - Calculation and Adjustment
  - Equipment Measurement
  - Energy Modeling
  - Baselines

CA Market Context: Whole Building Energy Efficiency

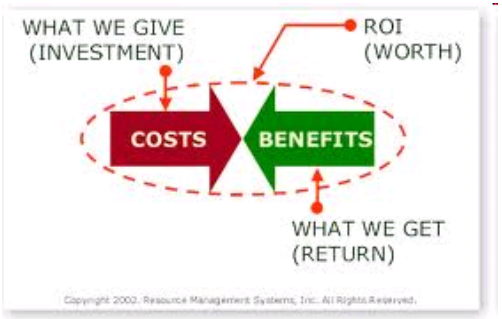
Market Drivers

- **EPA Energy Star, DOE SEP, ISO 50001**
- **Technology advancements**
- **LEED certification**
- **NBI / LBNL**



Market Challenges

- **Primary buyer vs benefit conflict**
  - Lack of energy driven corporate initiatives
  - Owner / operator / tenant issue
  - Whose job is it? Whose benefit?
- **Service provider certification**
- **ROI / project timing**
- **Building demographics**
  - Equipment demographics
  - Every building is different



PG&E Whole Building Energy Performance Program History

Program	Performance	Successes	Challenges
Commissioning (RCx, MBCx) (Calculated at equipment) Verification: measured at equipment)	• RCx, MBCx Annual Savings • ~20 GWh, 270K therms, 2000 kW	• Large EE savings per project • Market awareness	• Long pay back • Difficult savings claiming process • Manually intensive
Whole Building Pilot Program (Measured pre/post at equipment and meter)	• Cash flow positive • <5% financing on $1.5M project • 36 % Savings •>2.1 GWh, •100,000 kW, •60,000 Therms	• Highly engaged building engineer and ownership • Clear understanding of value beyond the financial benefit	• Stalled at corporate • Buyer / benefit conflict
Whole House Residential Retrofit (modeled whole house savings)	• 255 Homes since August • 36% average energy savings/ home	• Meets unmet market demand • Creates jobs / increases EE awareness	• TRC varies from 0.2 and 1.5 based on model, tool, and assumptions

Whole Building Regulatory Challenges Discussion Topics

Savings Approach	Issue	Suggestion
Whole Building – Measured	1. "Other things change" 2. What is the measurement?	1. Normalize for the "other things" - weather, sq ft, occupancy, units produced, refrigerated space, etc… - set of normalization factors by industry segment 2. Utilize national standards 1. EnergyStar Benchmark? EPI? EUI? Etc… 3. Industry handbook 1. NBI / LBNL handbook
Whole Building – Simulated approach	1. Variability in tools	1. One tool for Code 2. One tool for EE validated savings claim 3. Market set of tools for building engineers and designers 4. Agreed XML for sending data between tools

Whole Building Market Challenges Discussion Topics

Challenge	Suggested Topics
Primary buyer vs benefit conflict	1. Incentives at various points in value chain 2. Segment market to likely buyers 3. Consortium of vendors (Providers, Manufacturers, software developers, etc…)
Service Provider certification	1. EPA / DOE certification 2. LBNL / NBI Handbook
ROI / project timing	1. Ramped projects with bumper payments
Building demographic diversity	1. Segmented approach for different buildings 2. National database for building demographics (i.e. CEUS)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