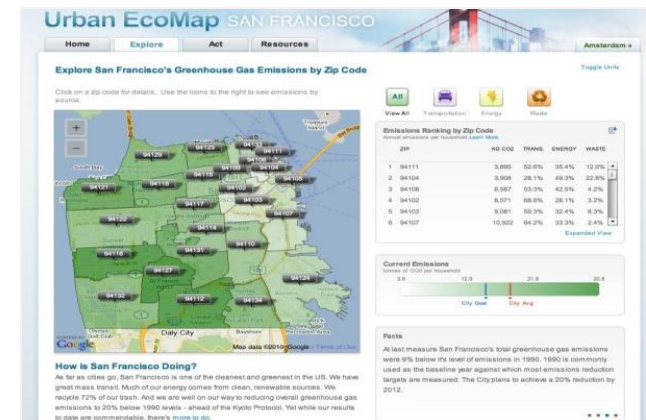


Delivering on the promise of Efficiency –

Democratizing Energy Data: A Transformative Path to Enabling Efficiency and Demand Response

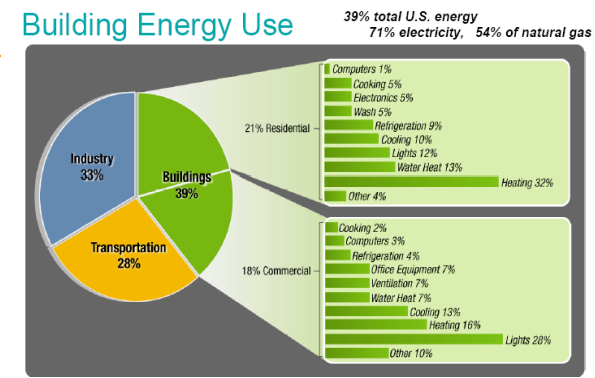


Harvey Michaels, Director
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Instructor: *Enabling an Energy Efficient Society*



MIT Energy Efficiency Strategy Project

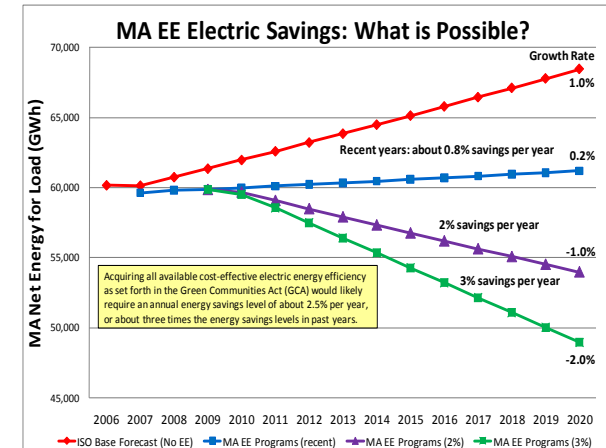
How will we Enable Energy Efficiency?



US Buildings consume 71% of all electricity, 55% of all natural gas

Goal: 30% efficiency achievable by 2030 with 4 Deployment options:

- Public funding models, utilities: *carrots*
- Codes and Standards: *sticks*
- Data and intelligence-driven : *information*
- New Business Models: *innovation*



Transforming the nation's consumers: Good energy decisions (ie lower discount rates) *change everything.*

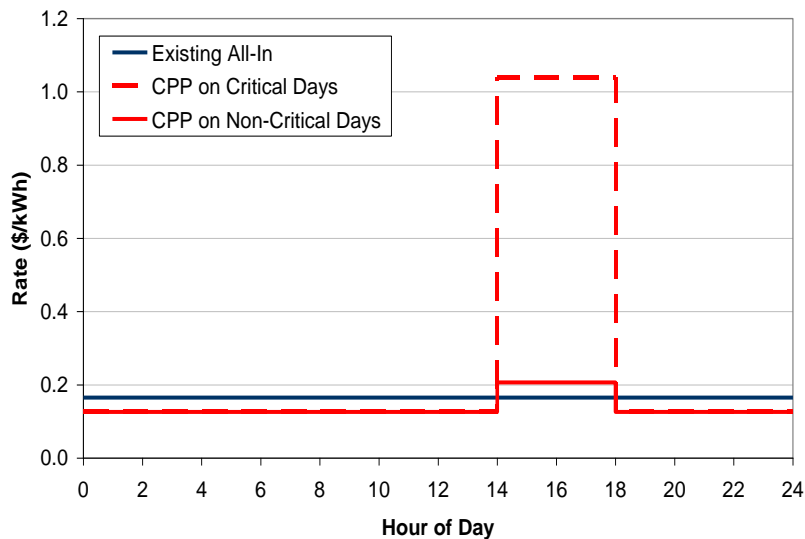
What does the Smart Grid have to do with Energy Efficiency?



Potentially, three strategies:

- Utility control of peak building energy use,
- Time-differentiated dynamic electricity pricing, and
- More frequent and granular energy consumption data to support operational improvements and behavior change.

Illustration of Residential CPP Rate



Estimated Annual Energy Cost Comparison[†]

02138		Yr:1955-1959, Bed:-, Bath:-, Sq Ft:1400-1599	\$3,238	60
Averages ▾ In Massachusetts		Yr:-, Avg Sq Ft:-	\$3,678	64

Find a House
Or double-click on the map

[†] Energy estimates are based on publicly available data for each home and typical usage data for households in your area.

Estimated Annual Energy Usage*

	Heating	\$1,834
	Cooling	\$9
	Lighting	\$256
	Appliances	\$741
	Water Heating	\$212
	Other	\$186
	Total	\$3,238

[See your complete energy breakdown - sign up!](#)

Potential Savings*

This house could **save up to \$1,201** per year

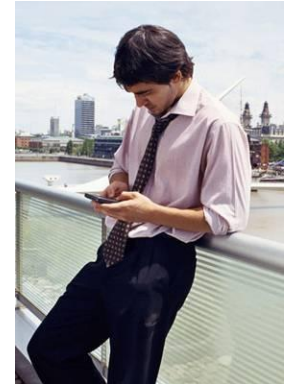
	\$2,037	\$3,238
	Potential	Estimated

[Get your personalized recommendations - sign up!](#)

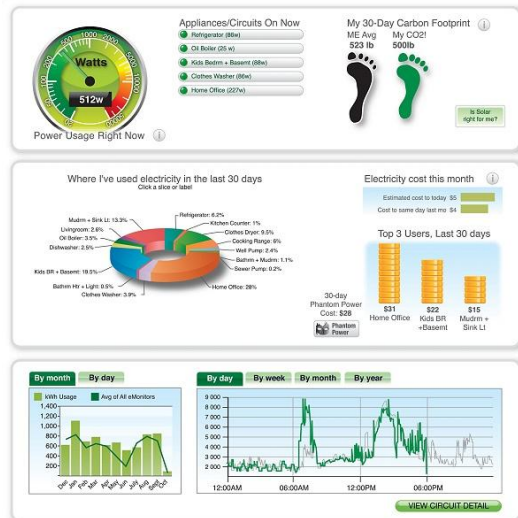
Granular Energy Data:

- energy diagnostics, feedback, control

Behavior impacts of smart grid-based information options may be as high as 30%:



- Daily
- End-use
- Carbon Footprint?
- Collective Action?
- Fault-detection
- Thematic Control – *make me green*
- Control Precision
- Adaptive Control Strategies

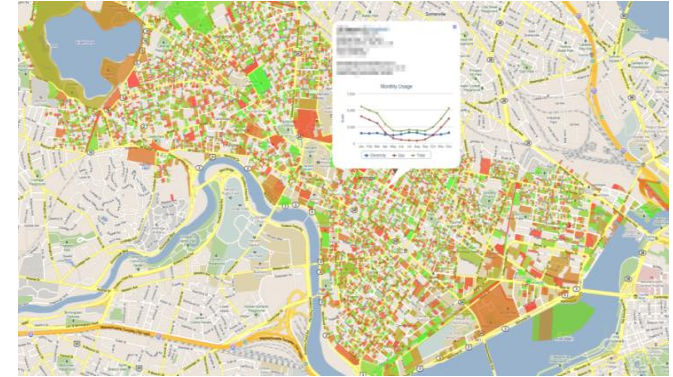


Community Energy Mapping/Visualization

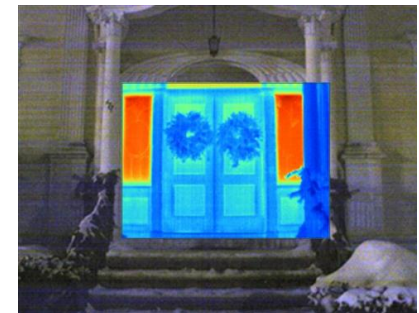
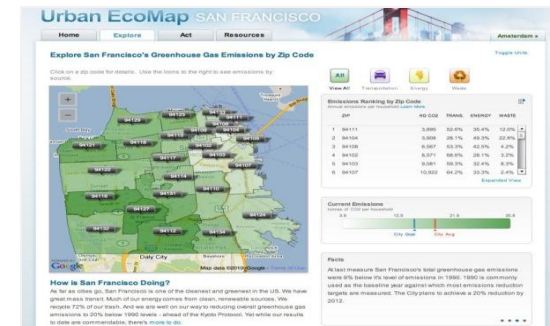
Sample Household to Neighborhood Comparison



Figure 2: Sample Community-Based Feedback Tool (McEwen, 2010)

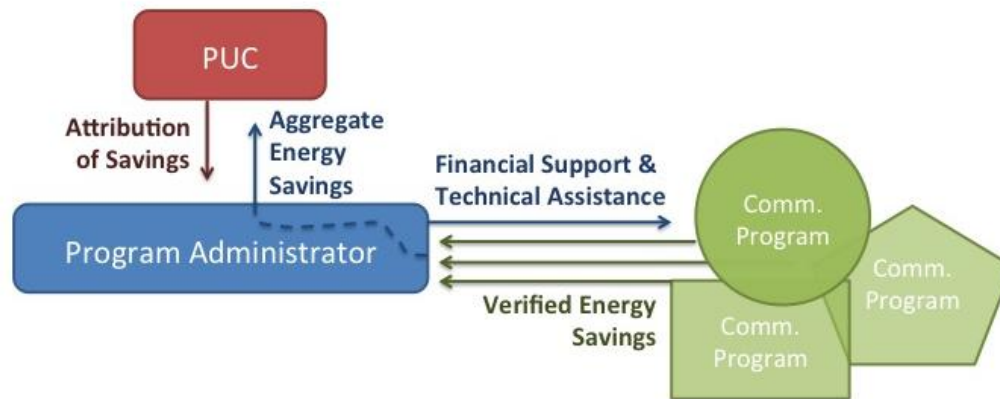


- *Efficiency discovery*
- *Efficiency delivery*
- *Efficiency measurement*



Democratizing Efficiency through Energy IT

Gameboard and Market Mechanism complements/replaces conventional utility efficiency model



- Expands the availability and effectiveness of energy and carbon data,
- Opens efficiency programs to new entrants, including communities.
- Effective framework by which efficiency innovations would be measured, and then rewarded based on results.
- Utilities buy energy efficiency, peak demand, and carbon benefits at prices reflecting avoided energy, capacity markets, and carbon trading.

Key Finding: Sustained innovation is most likely if the utility creates the enabling conditions for market-based systems

- **To accomplish this, utilities, regulators should focus on:**
 - *consumer-centric architectures for appliance control,*
 - *Open and public architecture for AMI communication,*
 - *Encouraging a broad ecosystem of content providers, including utilities.*

- **2013 – How will efficiency look – when the politics change?**
- **Smart meters and dynamic pricing – will we move forward?**
- **The nation's consumers – will we innovate, educate, and support good energy decisions? (ie lower discount rates)**

- **We can do this – *but can we do it in time?***