Creating the new energy economy

Wiring the Smart Grid for Energy Savings

New Markets, Players, and Opportunities for Energy Efficient Resources

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Agenda

What is the smart grid?

What problems are we trying to solve with the smart grid?

How could the smart grid help save energy?

Unresolved challenges

Smart Grid 101:
The IT boom for the electric grid

"the overlaying of a unified communications and control system on the existing power delivery infrastructure to provide the <u>right information</u> to the <u>right entity</u> (e.g. end-use devices, T&D system controls, customers, etc.) at the <u>right time</u> to take the <u>right action</u>."

- EPRI, The Green Grid

The electric grid

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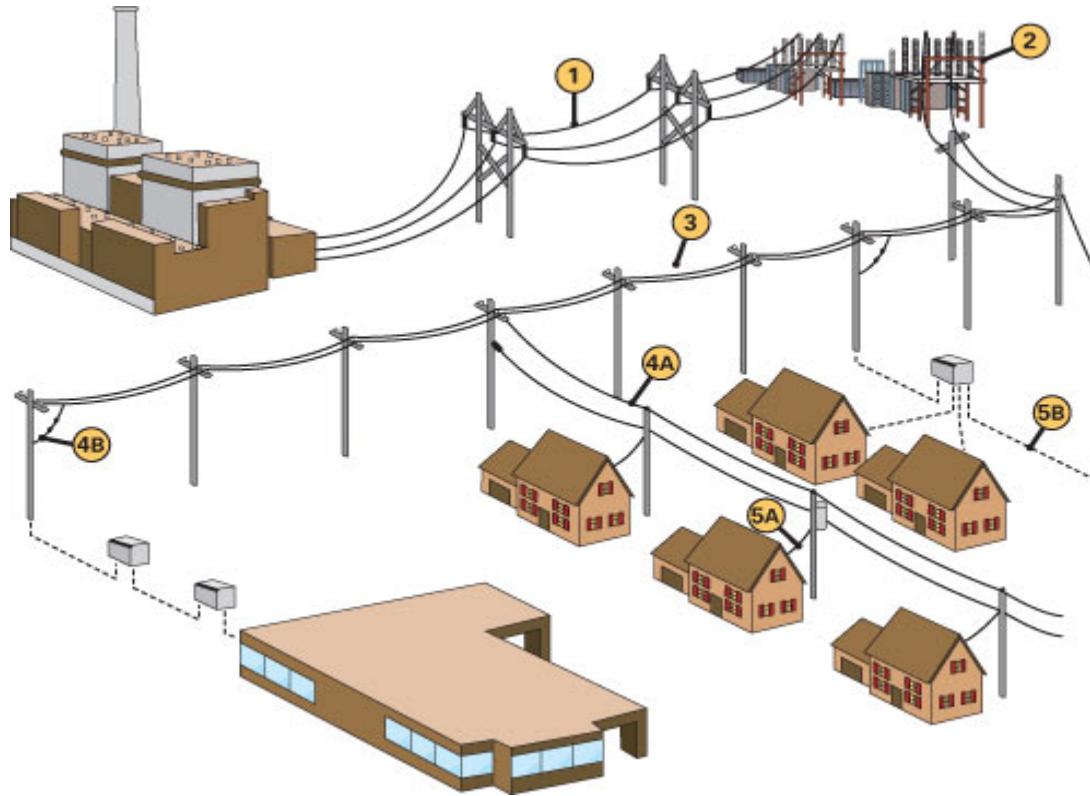
What are the problems with the old grid?

Grid needs to be updated

- Built for central station generation
- Blackouts, reliability, aging grid
- T & D bottlenecks, siting/building new lines

Demand is rising

- Peak load growth & costly new generation
- Lack of widespread demand response
- Customers don't see real prices

Need for new supply resources

- Difficulty in integrating variable generation sources (renewables)
- Difficulty in integrating widespread distributed generation

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The next generation electric grid accommodates:
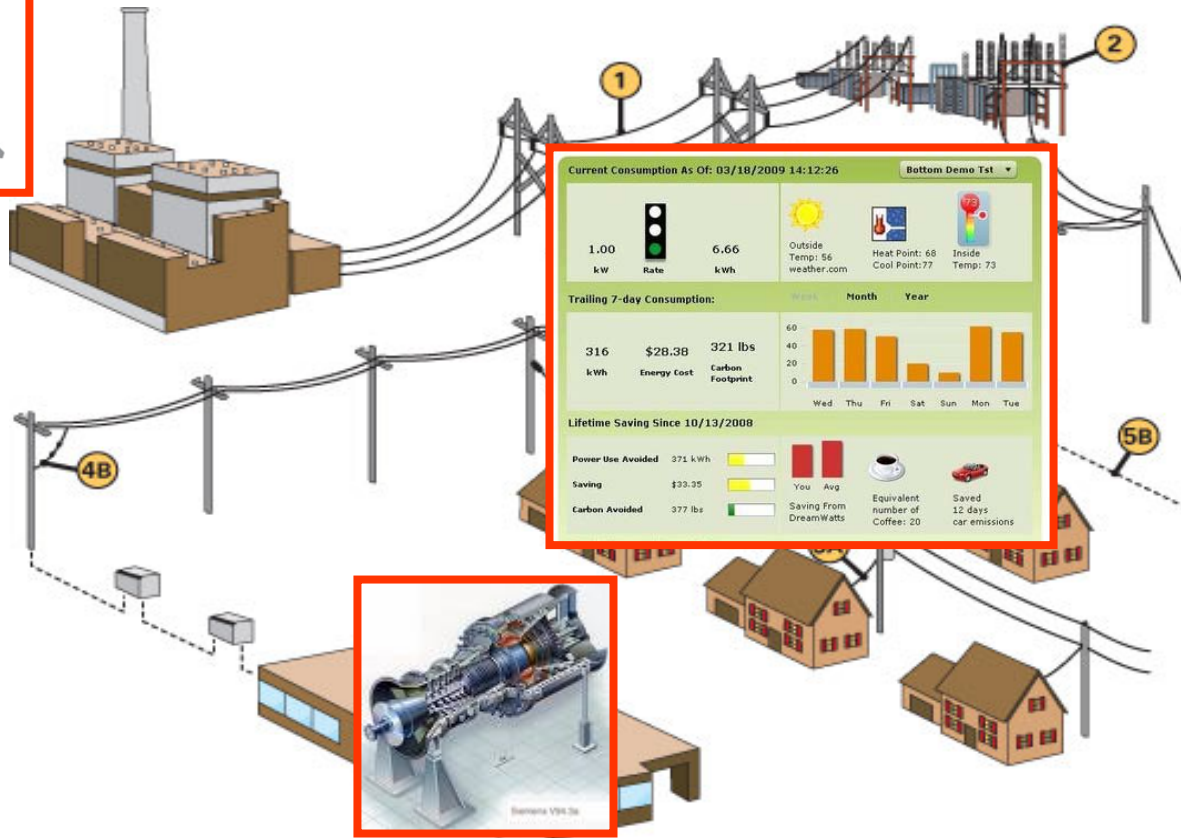
Applications that will use Smart Grid infrastructure

Generation

- Central plant renewables
- Distributed generation/cogen
- Power quality for digital economy

Transmission & distribution

- Distribution automation/load balancing
- Self-healing grid operations
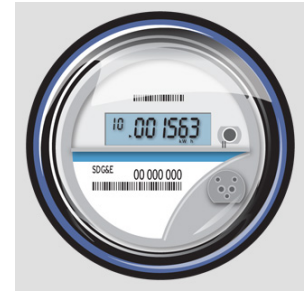- Remote disconnect, meter reading

Electric loads

- Demand response
- Energy conservation
- Storage options

Smart Grid enabling infrastructure

Intelligent devices

- Smart meters (part of Advanced Metering Infrastructure)
- Sensors
- Grid-aware equipment

2-way communications (interoperable)

- Networking technology
- Communication pathways like cable, Wi-Fi, powerline

Advanced control and data management systems

- Automated decision-making on supply and demand side
- Meter data management systems

"The Electricity Economy: New Opportunities from the Transformation of the Electric Power Sector",
Global Environment Fund and Global Smart Energy - 2009

Smart Grid enabling infrastructure

Smart Grid is not the end, it's the means to the end

It's what we DO with a smarter grid that matters
- Installing monitoring equipment alone doesn't save energy

The Smart Grid requires controllable buildings

Does it make sense to use Smart Grid technology to communicate with buildings that aren't controllable?

- Buildings need to work to participate in DR programs
- Implement Cx with DR programs
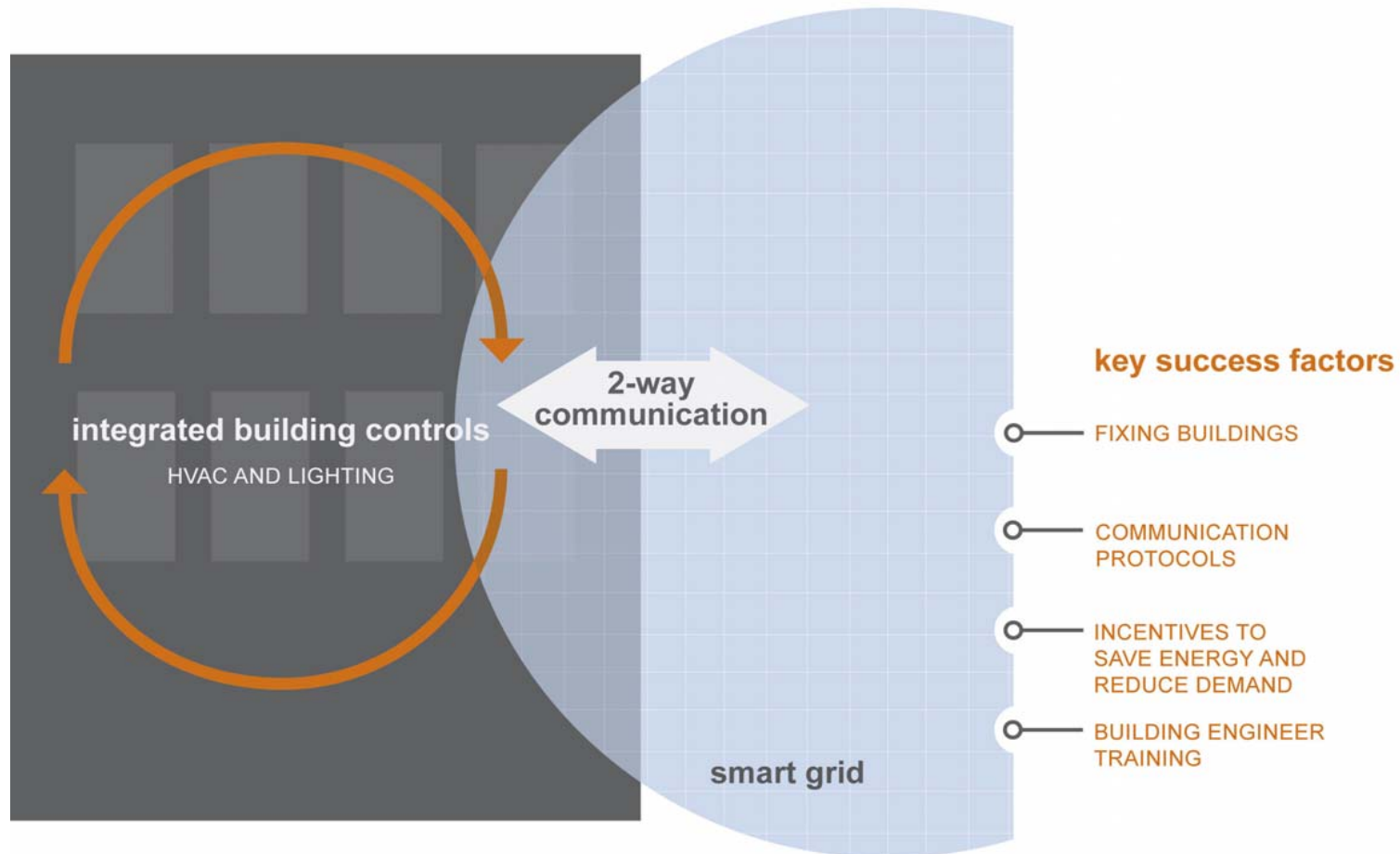- DR signals lead to predictable responses

Interoperability is key

Control systems will need to work together seamlessly

- Integration of different control systems
- Integration of cogeneration and other DG into buildings and with the grid

# Building system integration with the Smart Grid

Energy savings through the Smart Grid

Improved energy efficiency and conservation due to:

- Time of use pricing
- Improved energy use information
- Lower utility program admin costs
- Automated diagnostics

Energy savings through the Smart Grid

Smart Grid Investment

Energy Savings

$ Savings

ENERGY SAVINGS
IMPROVES SMART GRID
COST-EFFECTIVENESSS

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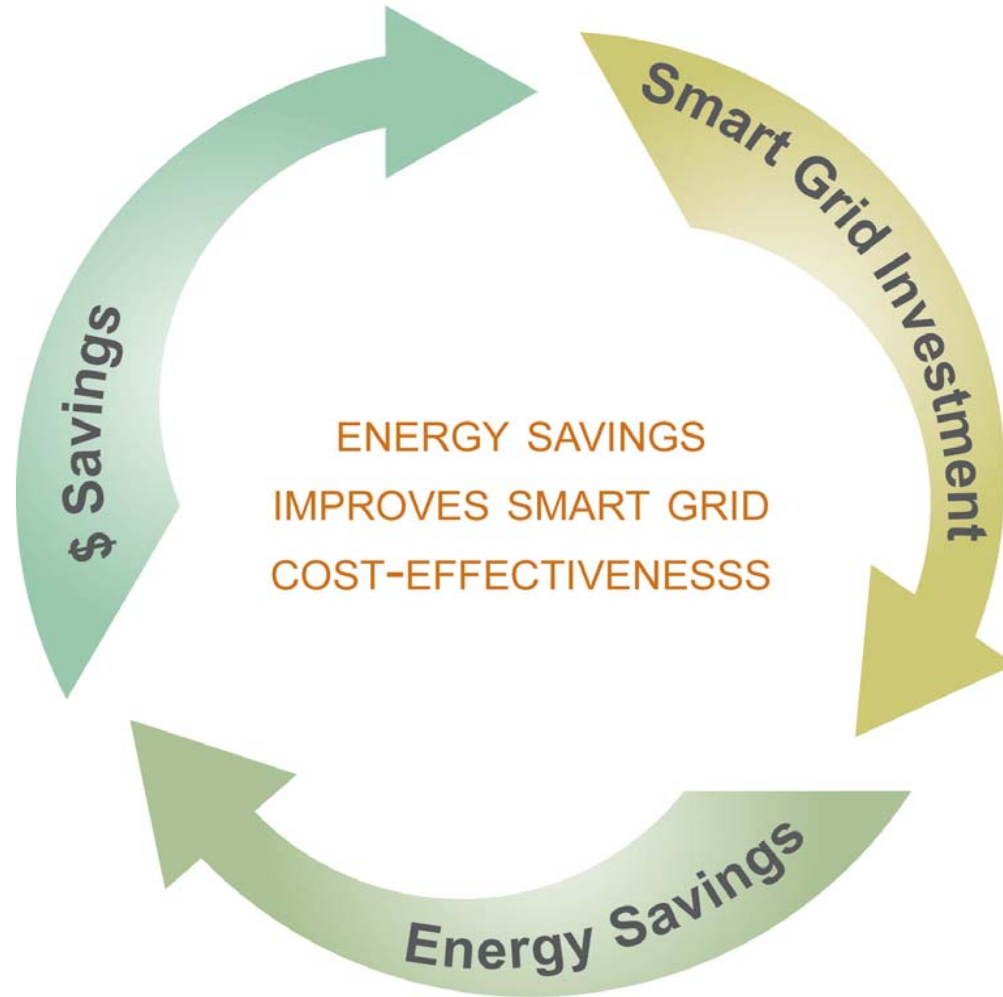
1. Energy savings due to time of use pricing

Peak demand reduction programs achieve some energy savings

- 4% energy savings in early studies
- Either active or automated participation
- Example: Avoiding usage (lighting) vs. load shifting (clothes washer)

Paying the true cost of power

- Increased awareness/reduced consumption

2. Energy savings due to improved energy use information

Energy savings through active participation and behavior changes
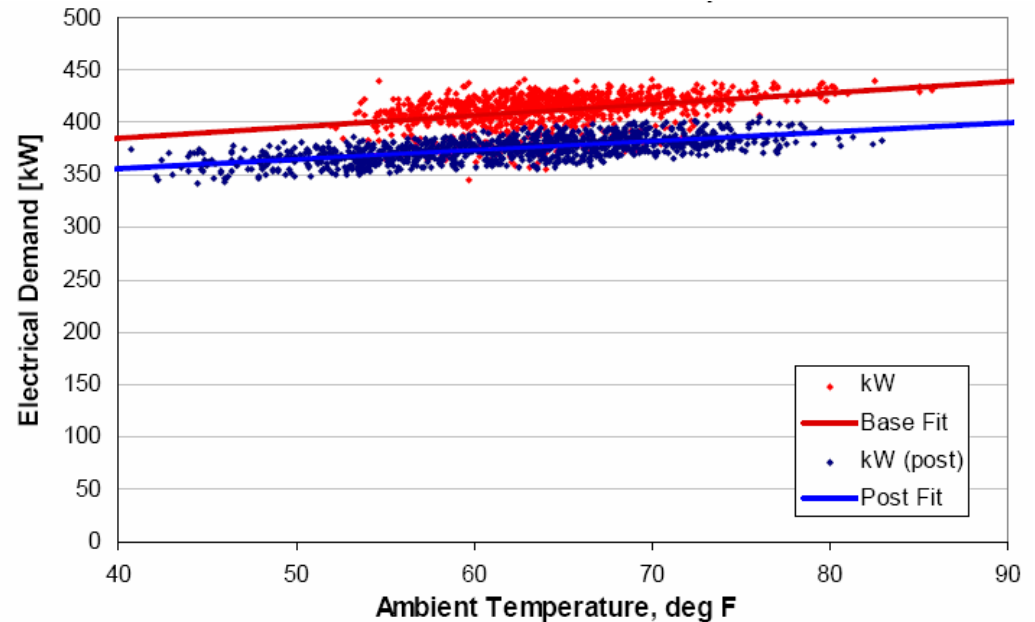
- 11% energy savings in early studies

3. Utility program cost savings

Better data to assess potential savings in target markets

Use of data for EM&V

Source of graphic: California Commissioning Collaborative, *Guidelines for Verifying Existing Building Commissioning Project Savings - Using Interval Data Energy Models: IPMVP Options B and C*

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4. Automated diagnostics

Will utilities start providing diagnostic services?

In electric meter data, we can see these issues:

- Scheduling
- Unoccupied energy use
- Demand peaks
- Correlations of outside temperature and energy use

How far will Smart Grid data systems "see" into end-uses?

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A few of many unresolved challenges

What will motivate customers to be active participants with the grid?

- What is the "killer app" to increase motivation?
- What level of technology is needed for which customers?
- How much will improved information lead to changed behavior?

How will we fix all these buildings and get them ready to interface with Smart Grid infrastructure?

- Cx industry workforce expansion
- Automated techniques

Smart Grid Driver:
Utility regulatory framework

What are good investments for a utility?

EE investments

- Pass through expenses, no rate of return
- Expenses go with rate case period (2-3 years)

Smart Grid investments

- Capital investment, earn rate of return
- Stimulus funding and public support

Summary

Smart Grid is an enabling infrastructure – it's what we do with it that matters

The Smart Grid requires controllable buildings

Interoperability is key – buildings will need to be commissioned to interact with the grid

With focus, the Smart Grid infrastructure can enable energy savings

Questions?

Creating the new energy economy