



**EDISON ELECTRIC
INSTITUTE**

The Smart Grid: *Its Time Has Come*

Mike Oldak

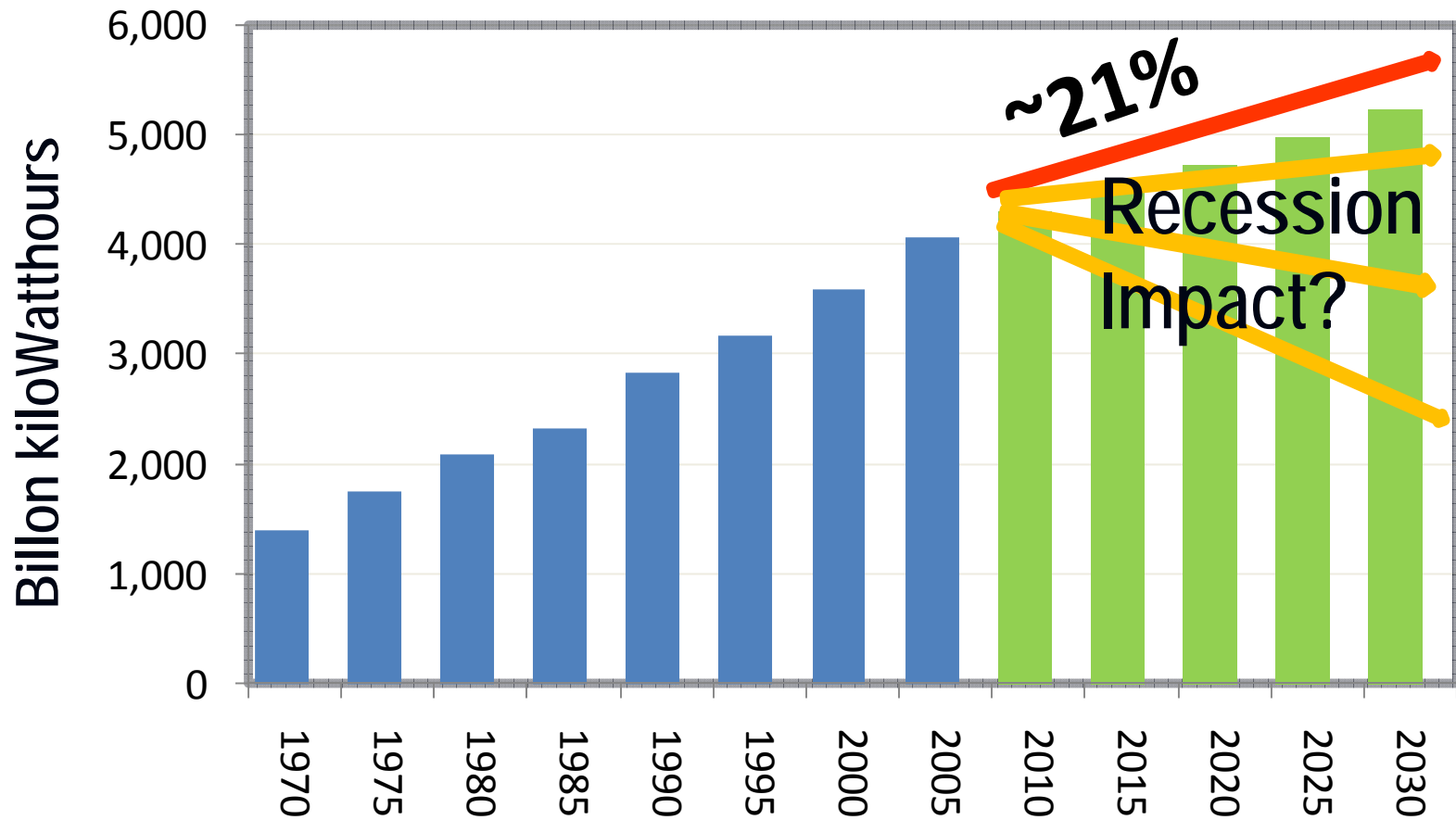
Sr. Dir. State Competitive & Regulatory Policies
Edison Electric Institute

The Smart Grid and Energy Storage Roundtable
Kansas Corporation Commission, Utilities Division
September 18, 2009



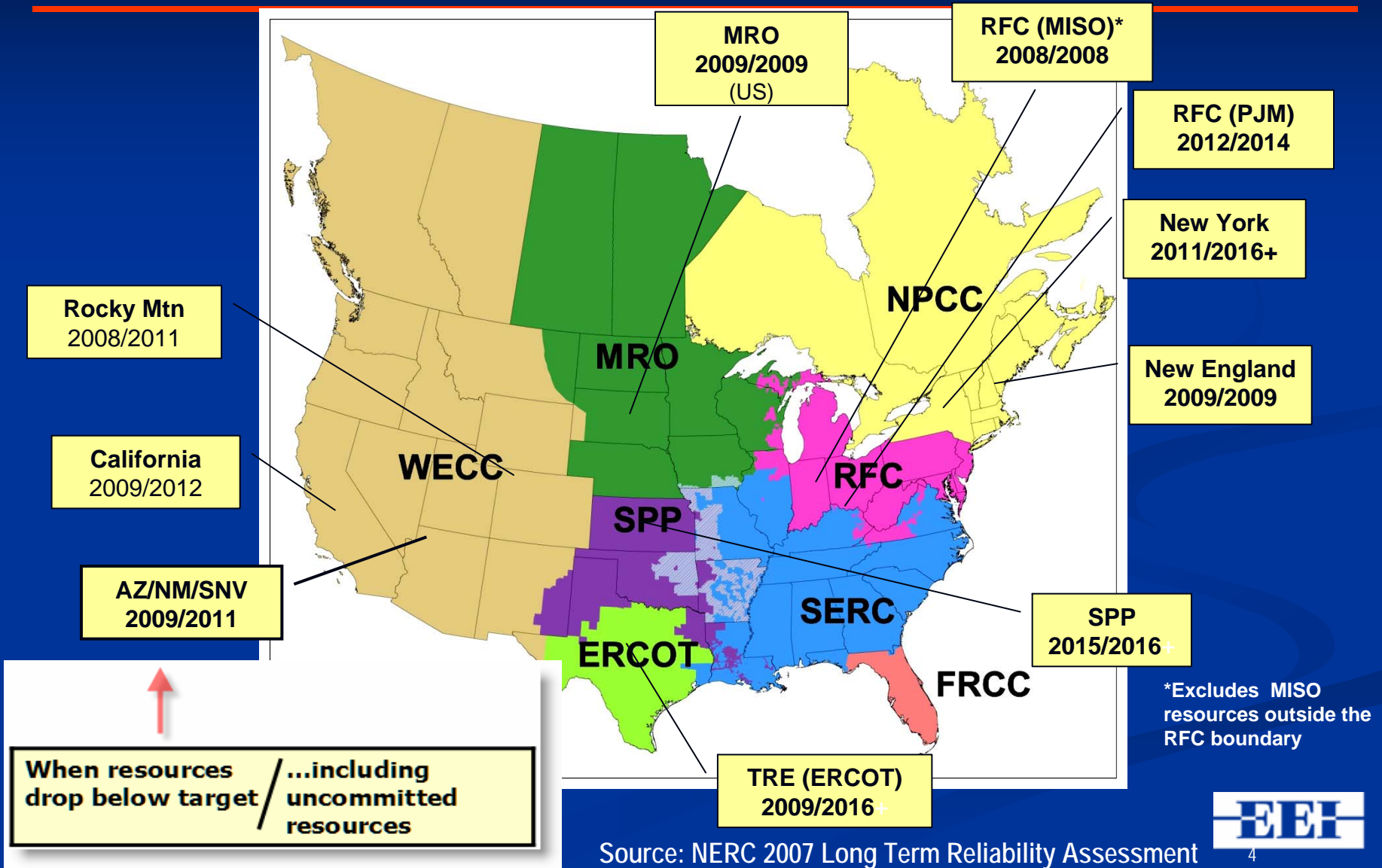
Where Are We?

Demand Projected To Increase ~~40%~~ 21% by 2030



Sources: U.S. Department of Energy, Energy Information Administration

Margins Projected to Fall Below Minimum Target Levels (2007)



Source: NERC 2007 Long Term Reliability Assessment



Financial Crisis

**Making Access to
Financial Markets Difficult**

View Forward

President Obama's Energy / Environmental Views

Climate Change

80% reduction by 2050
H.R. 2454 83% reduction by 2050

Renewable Portfolio Standards

25% by 2025
H.R. 2454 20% by 2020

Energy Efficiency

Overhaul of
Federal Efficiency Codes
In H.R. 2454

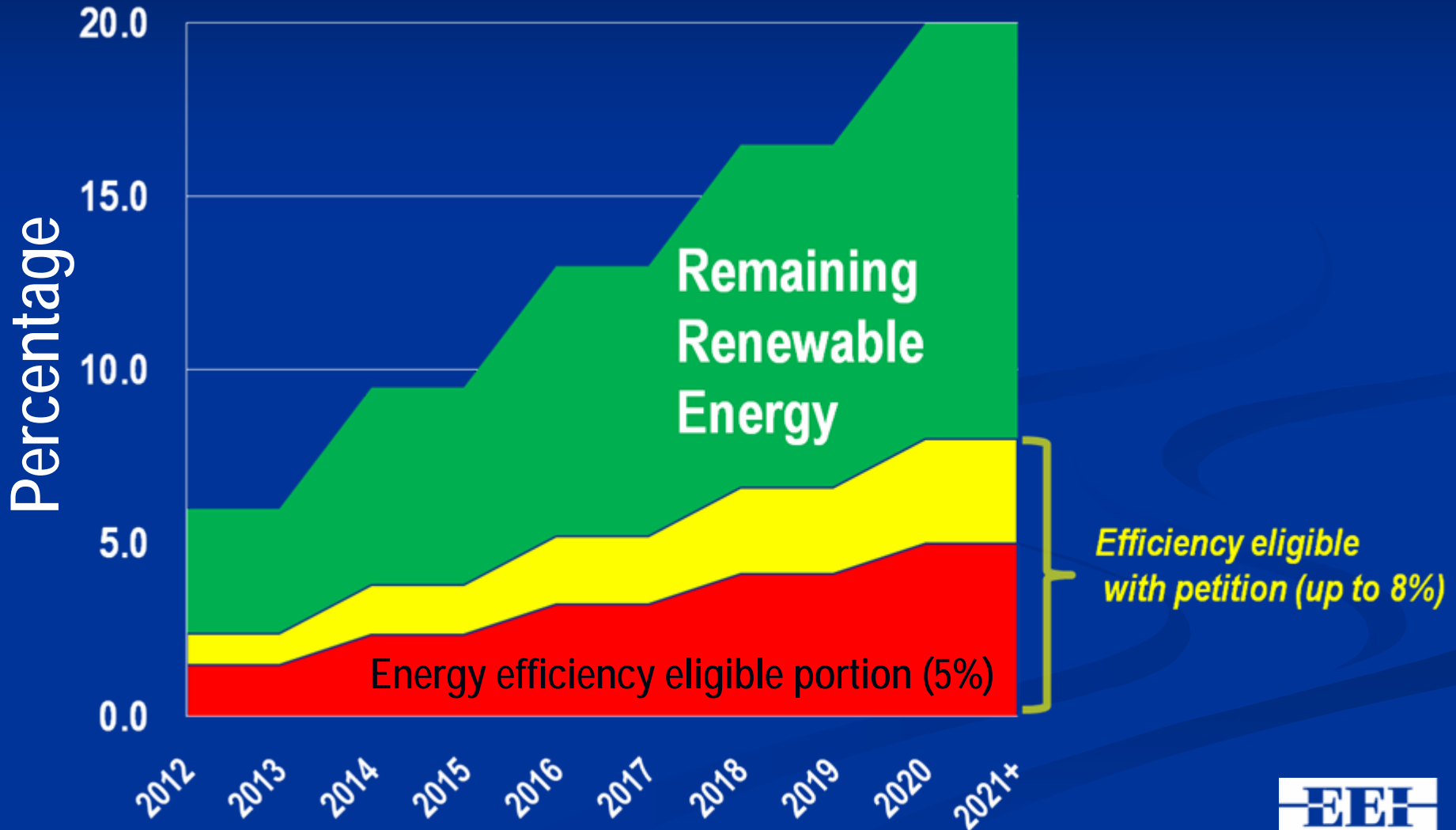
Smart Grid

Increased Government Support
In H.R. 2454 and stimulus
package



The Enhanced Role for Renewables

Waxman-Markey Combined Efficiency and Renewable Energy Standard



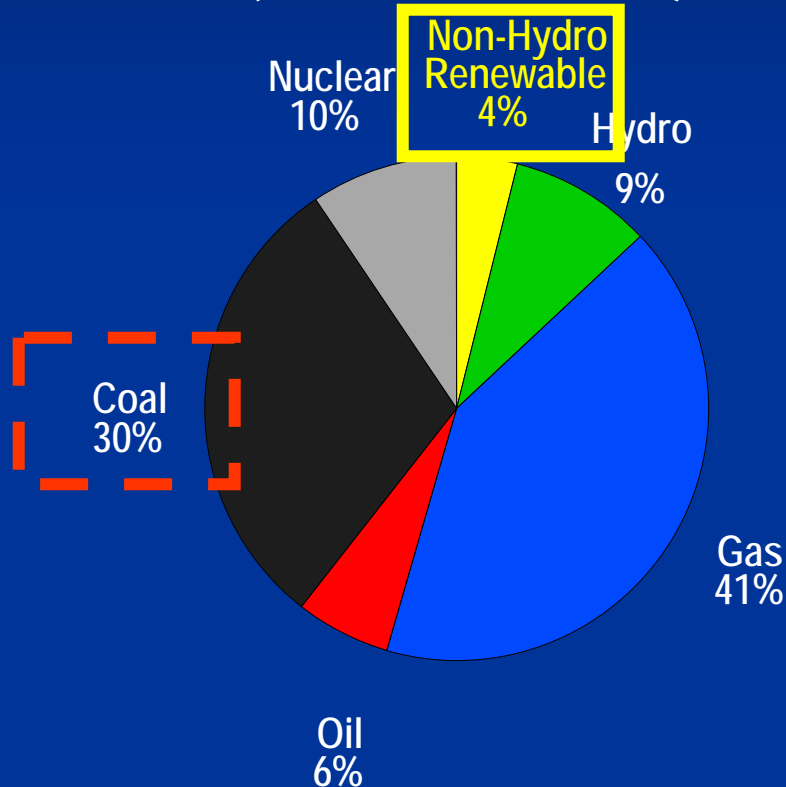
CERES Requirements as Percentage of Retail Sales



Planned Capacity Additions Reflect State RPS Requirements

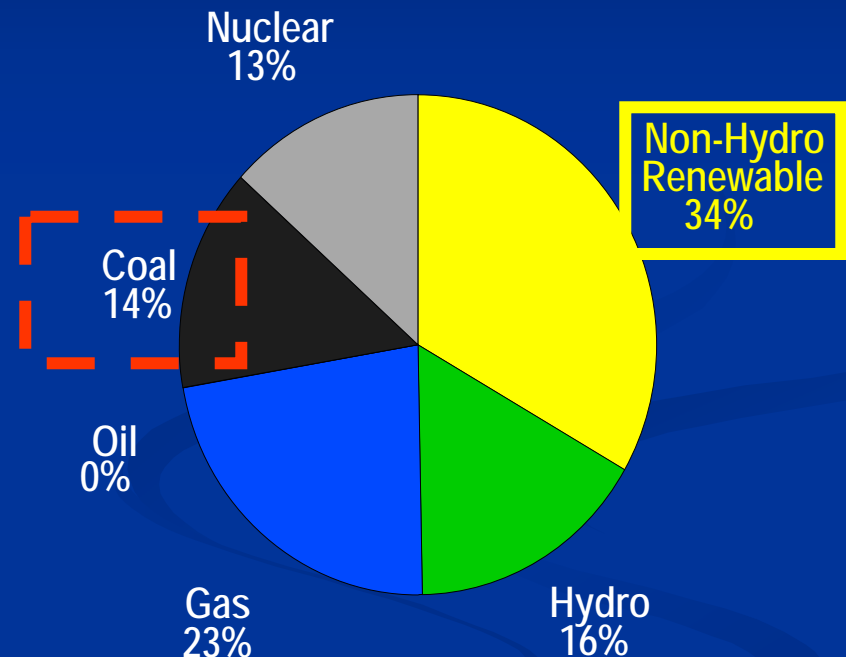
US Generation Capacity in 2008

(1,061 GW in Service)



Planned Capacity Additions to 2020

(352 GW)

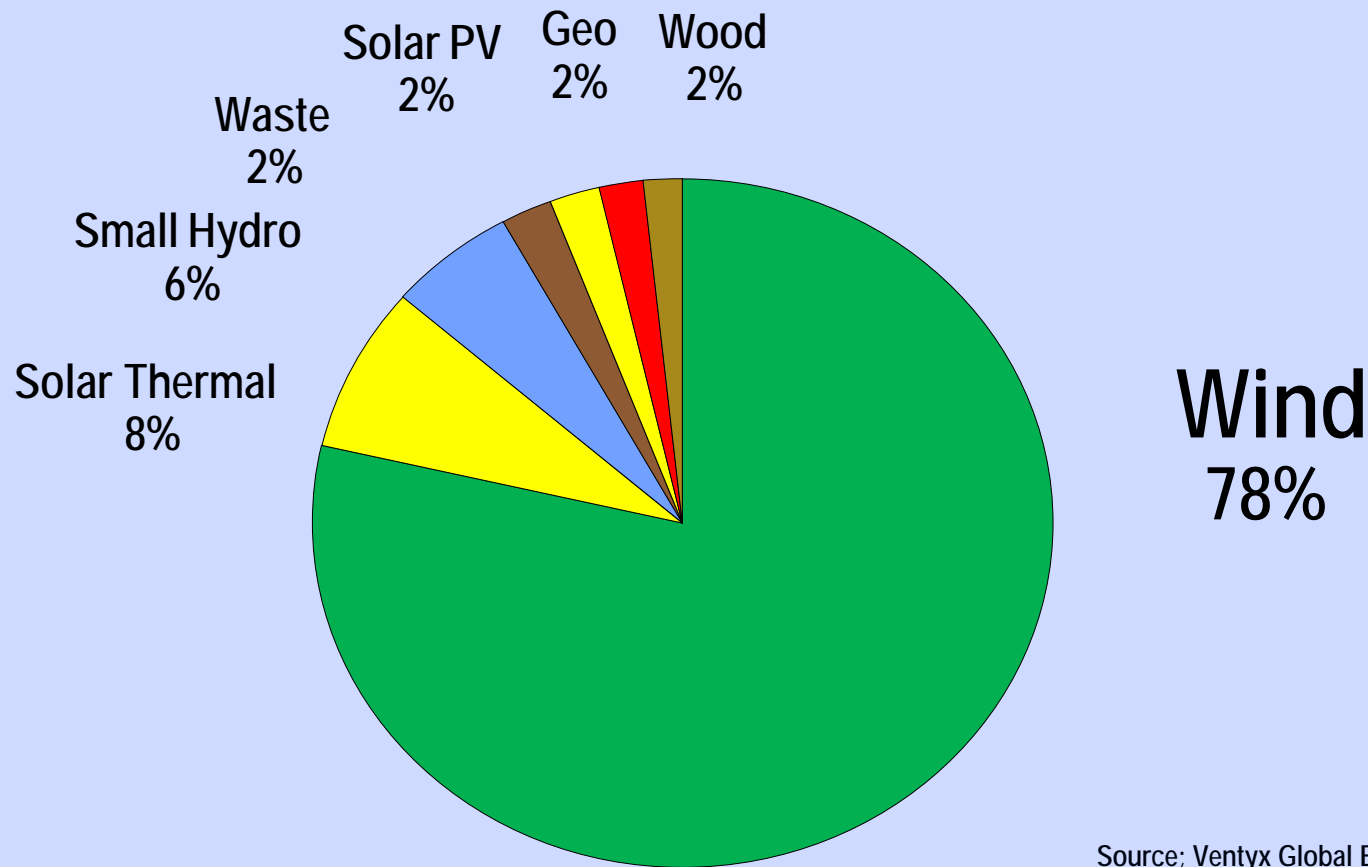


Source: Ventyx Global Energy and Bernstein Analysis

Non-hydro renewables make up 4% of US capacity today but 34% of planned capacity additions through 2020.



Wind Dominates Proposed Renewable Capacity Additions Thru 2020



Source; Ventyx Global Energy and Bernstein Analysis

- Wind is 78% of planned renewable additions, solar thermal 8%, solar photovoltaic 2%
- Wind's off-peak capacity limits usefulness on power grids

Integrating Renewables

Operational Challenges

- Higher RPS levels can create significant surplus energy
 - Has created excess energy at night
- Requires more system backup to maintain reliability
 - Quick start and fast ramping technologies (peaking / storage) to manage generation variability and maintain reliability when wind falls off or clouds appear
- Smart grid can help mitigate some of these problems
 - Energy storage / off-peak electric vehicle charging can mitigate problem
 - Smart grid will help enable these new technologies

What is the Smart Grid?

What is the Smart Grid?

*An advanced, telecommunication / electric grid with **sensors and smart devices** linking all aspects of the grid, from generator to consumer, and **delivering enhanced operational capabilities** that :*

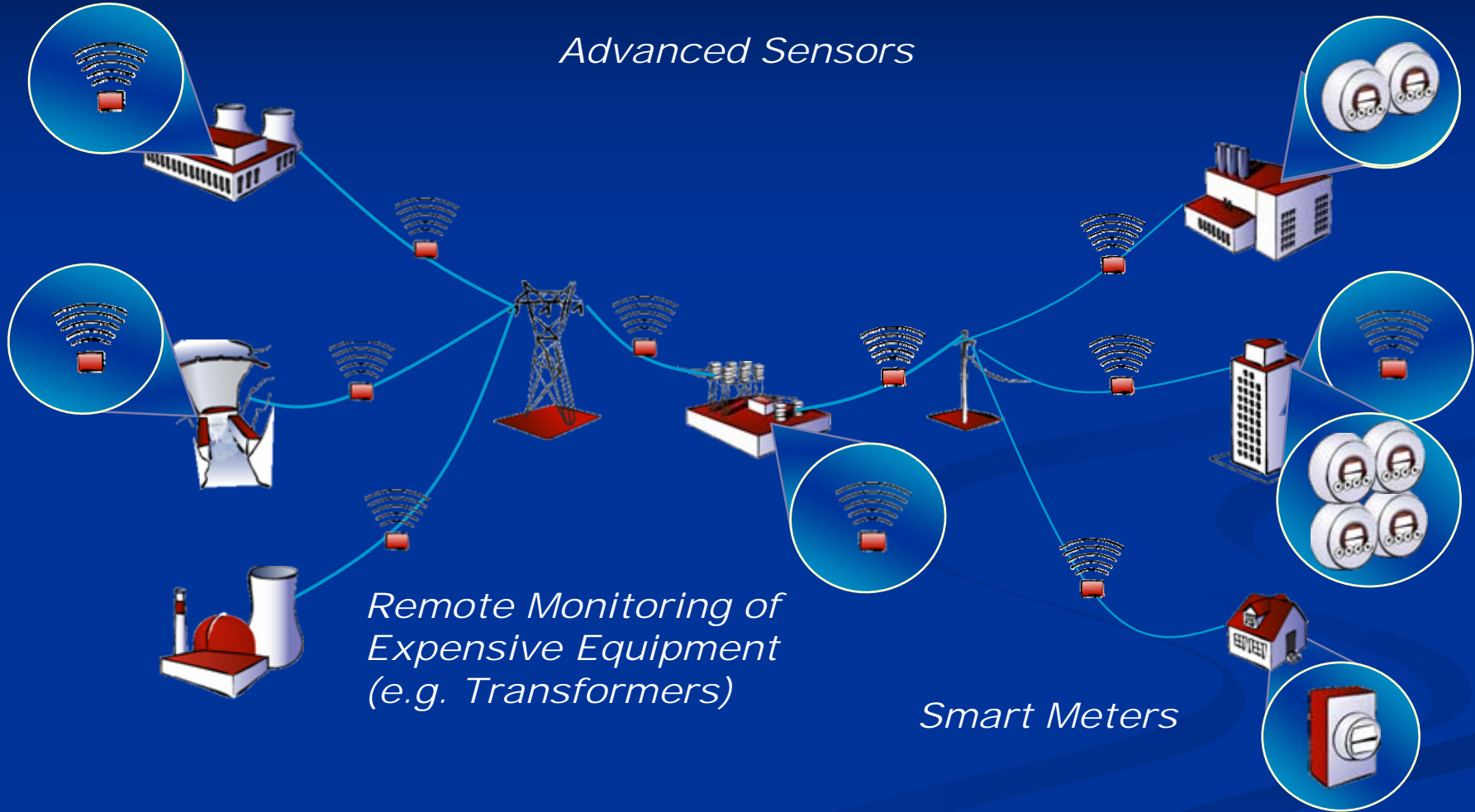
*Provide **CONSUMERS** with **the information and tools** necessary **to be responsive** to electricity grid conditions (including price and reliability) through the use of electric devices and new services (from smart thermostats to PHEV)*

*Ensure **EFFICIENT** use of the electric grid (**optimizing current assets** while **integrating emerging technologies** such as renewables and storage devices)*

*Enhance **RELIABILITY** (**protecting the grid** from cyber and natural attacks, **increasing power quality** and promoting early detection and self correcting grid "**self-healing**")*

Smart Grid ... Sensing and Measurement

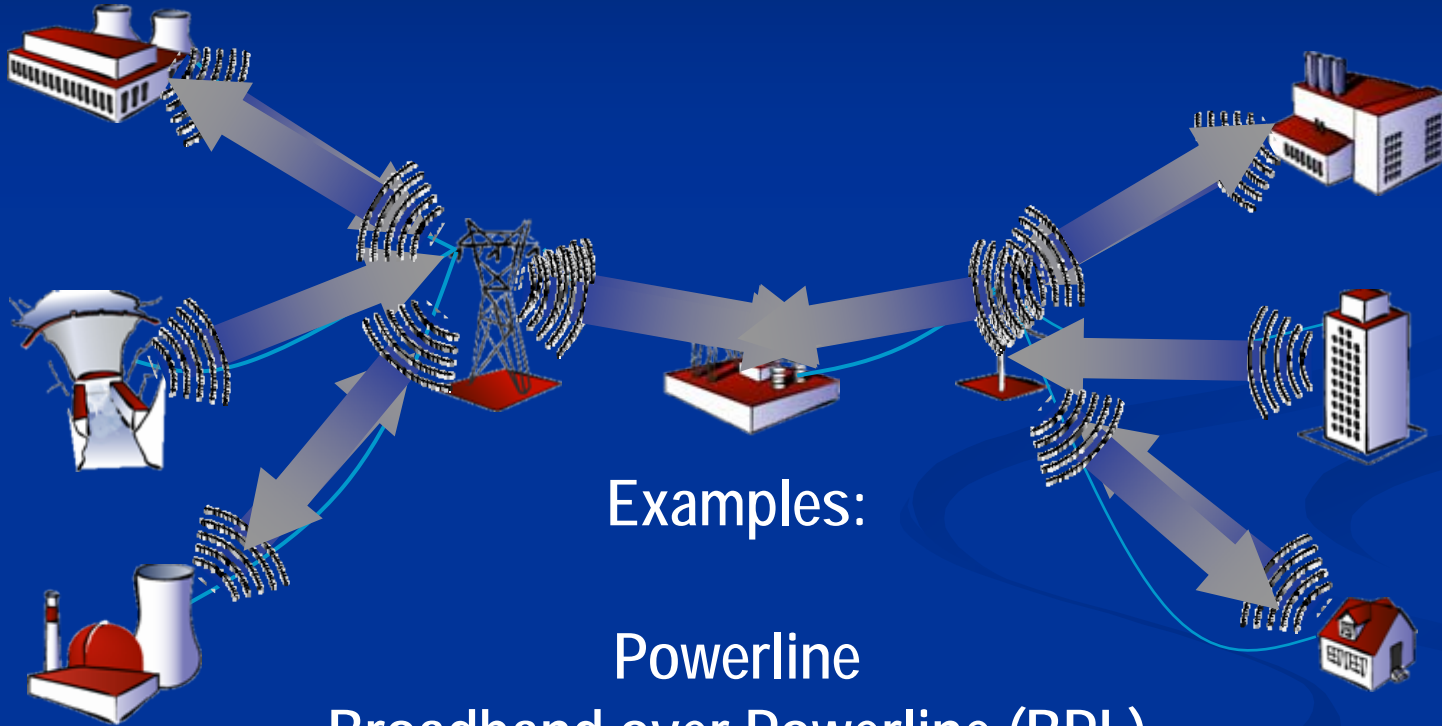
Advanced Sensors



*Remote Monitoring of
Expensive Equipment
(e.g. Transformers)*

Smart Meters

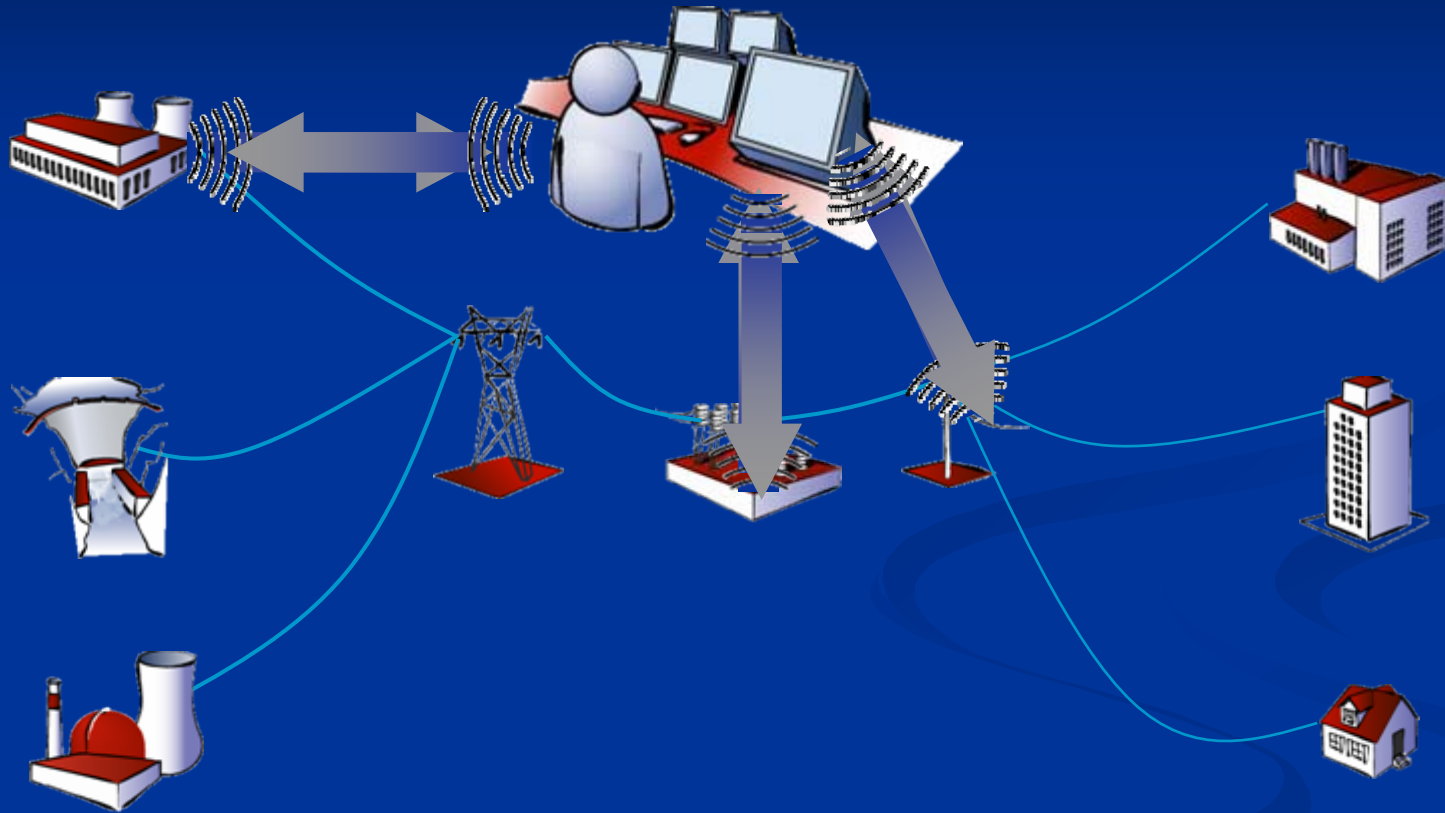
Smart Grid ... Integrated Communications



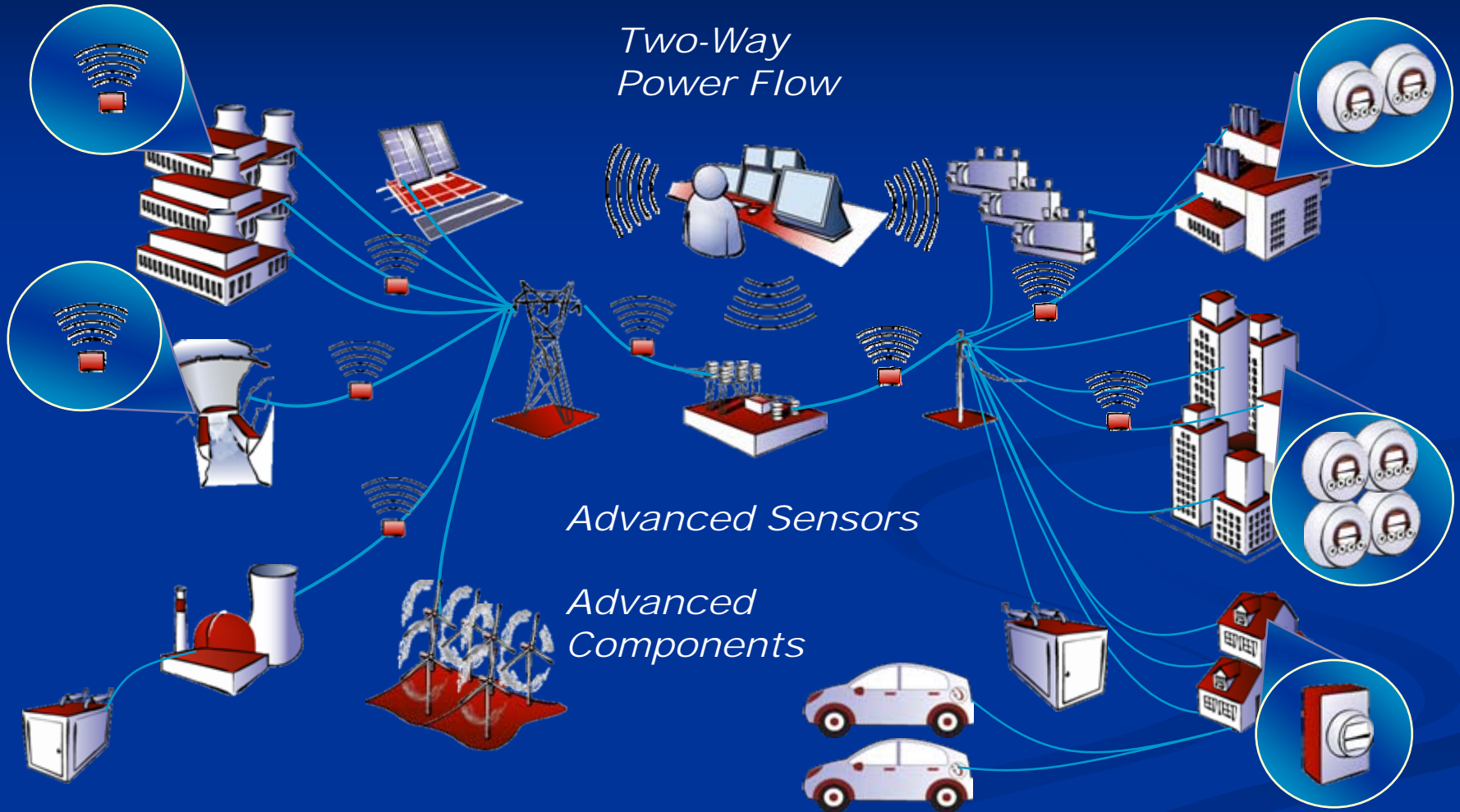
Examples:

- Powerline
- Broadband over Powerline (BPL)
- Cellular
- Radio Frequency (RF)
- Satellite

Smart Grid ... Advanced Control



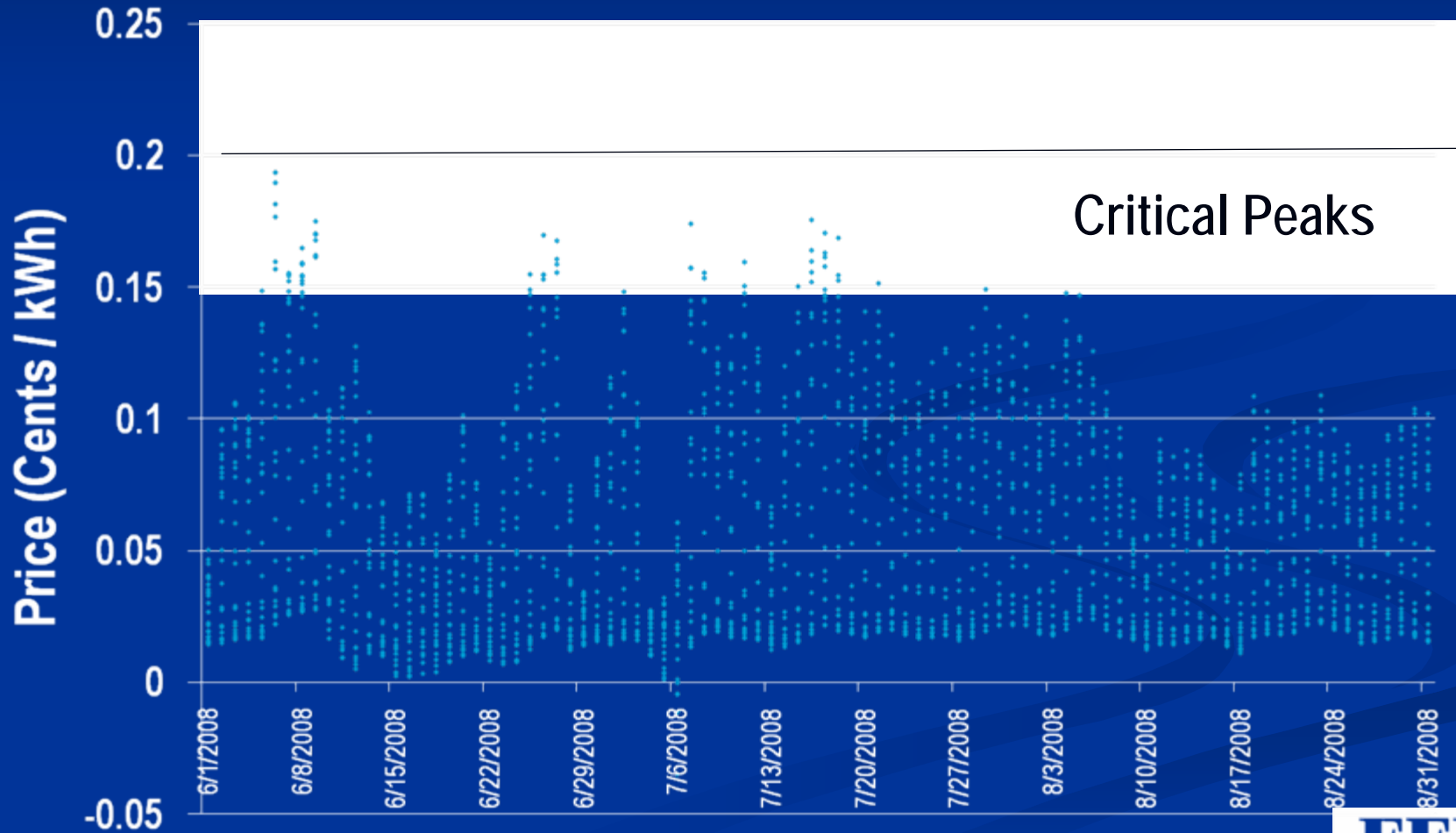
Tomorrow's Smart Grid



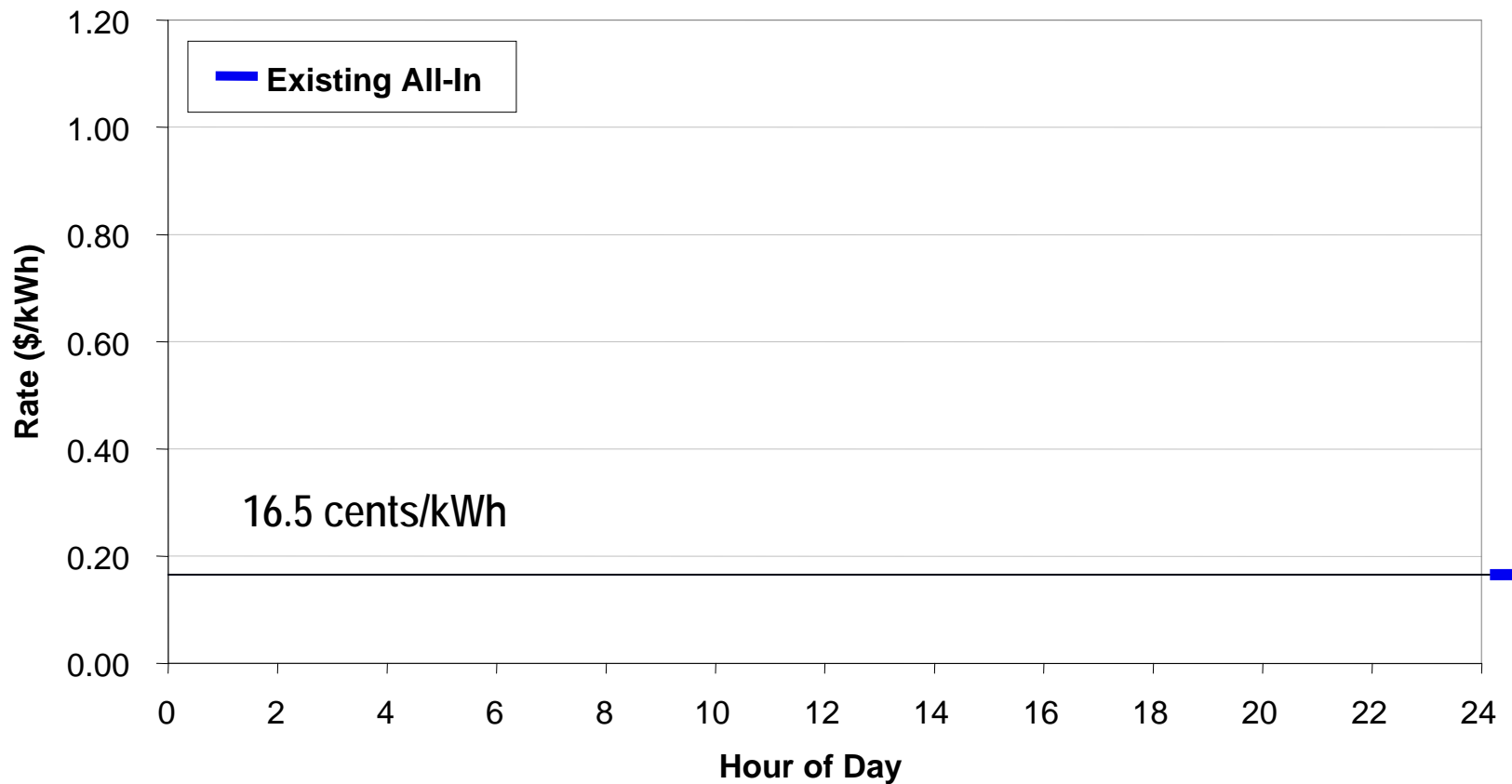
How Does It Add Value For
Consumers and Utilities?

How Smart Grid and Smart Rates Can Help

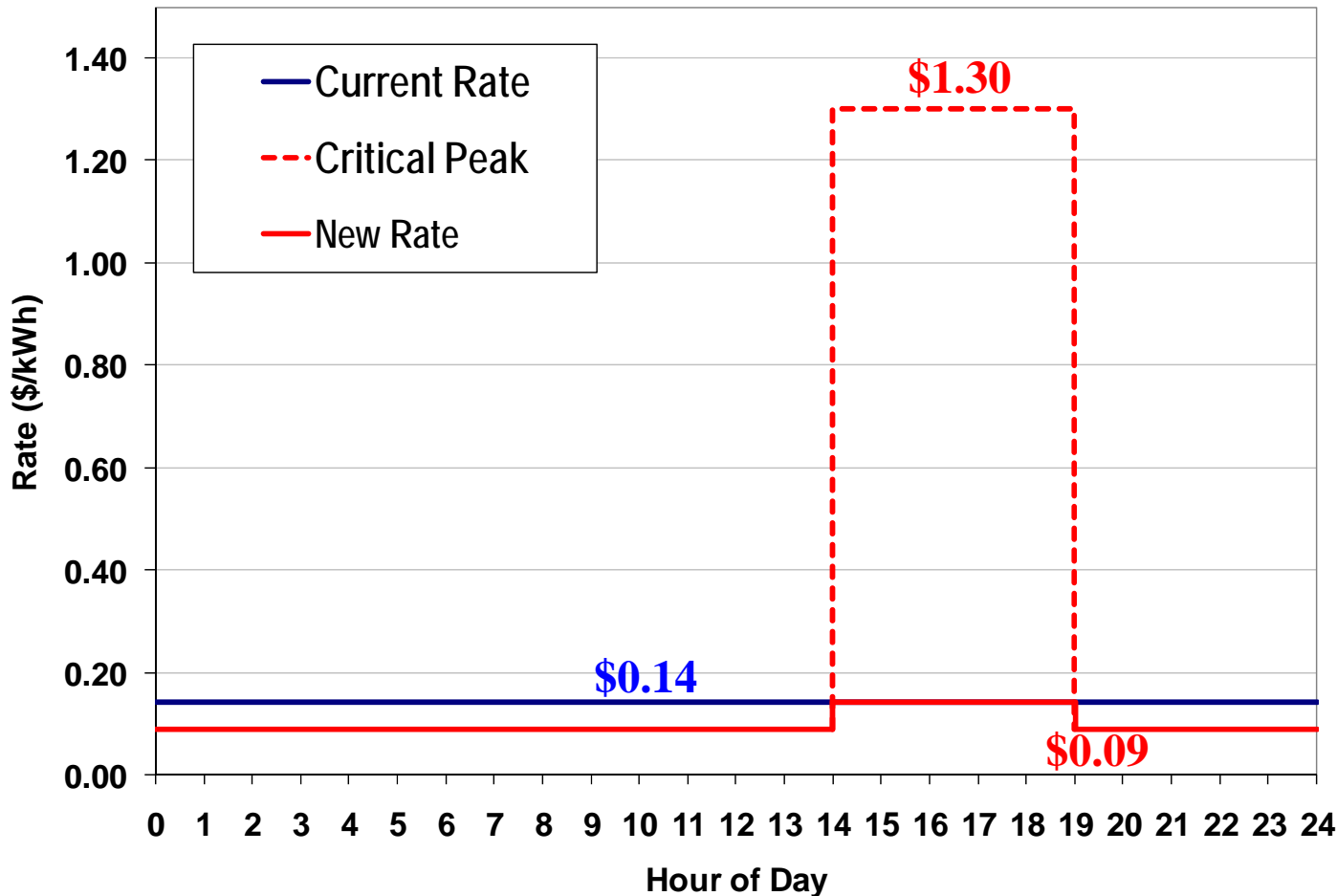
Summer Hourly Electricity Price



Flat Residential Rate



Dynamic Peak Pricing: Weekdays (excluding Holidays)



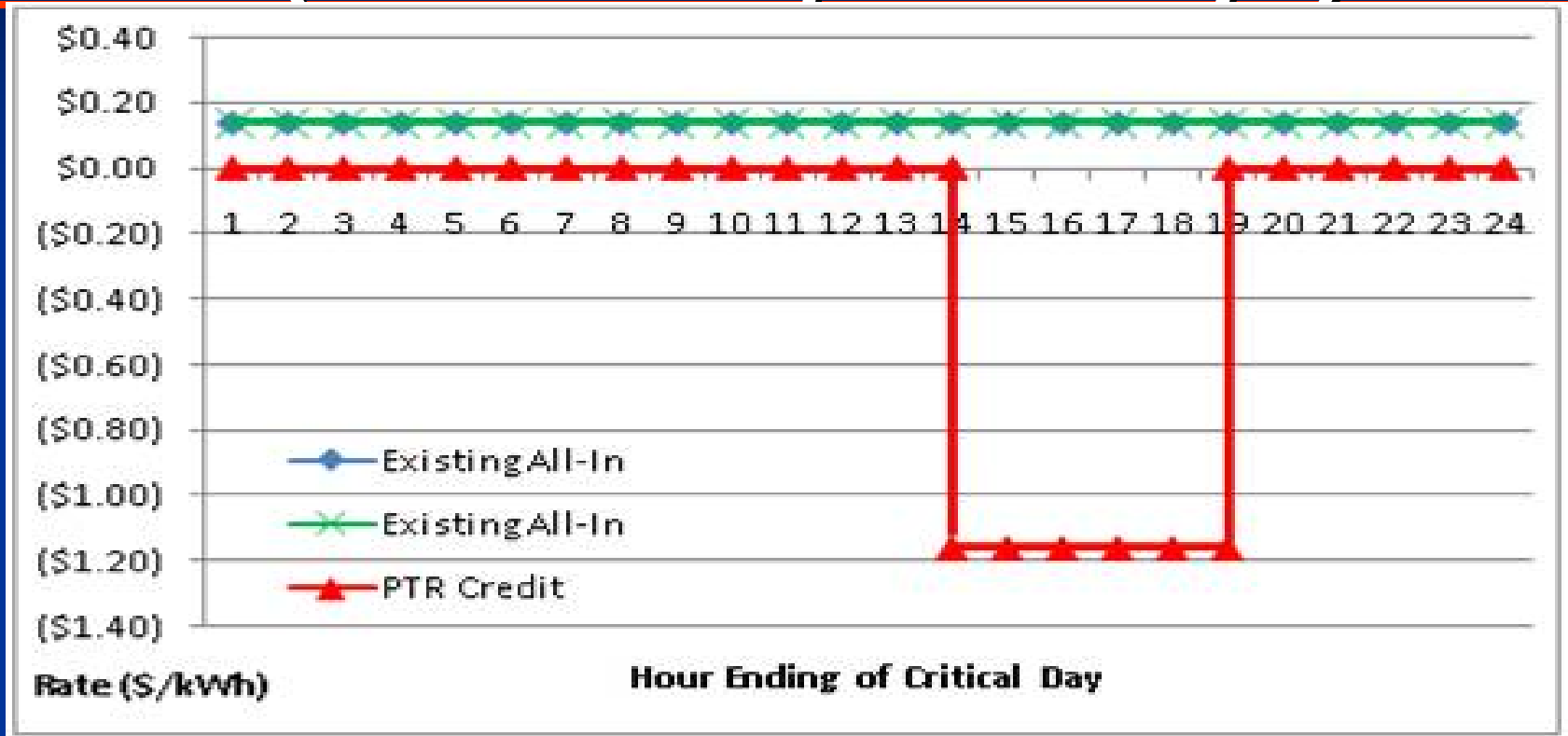
Pilot Pricing
All-in Rate*

Critical \$1.30425
Peak \$0.14425
Off-Peak \$0.09425

Includes generation,
transmission and
delivery



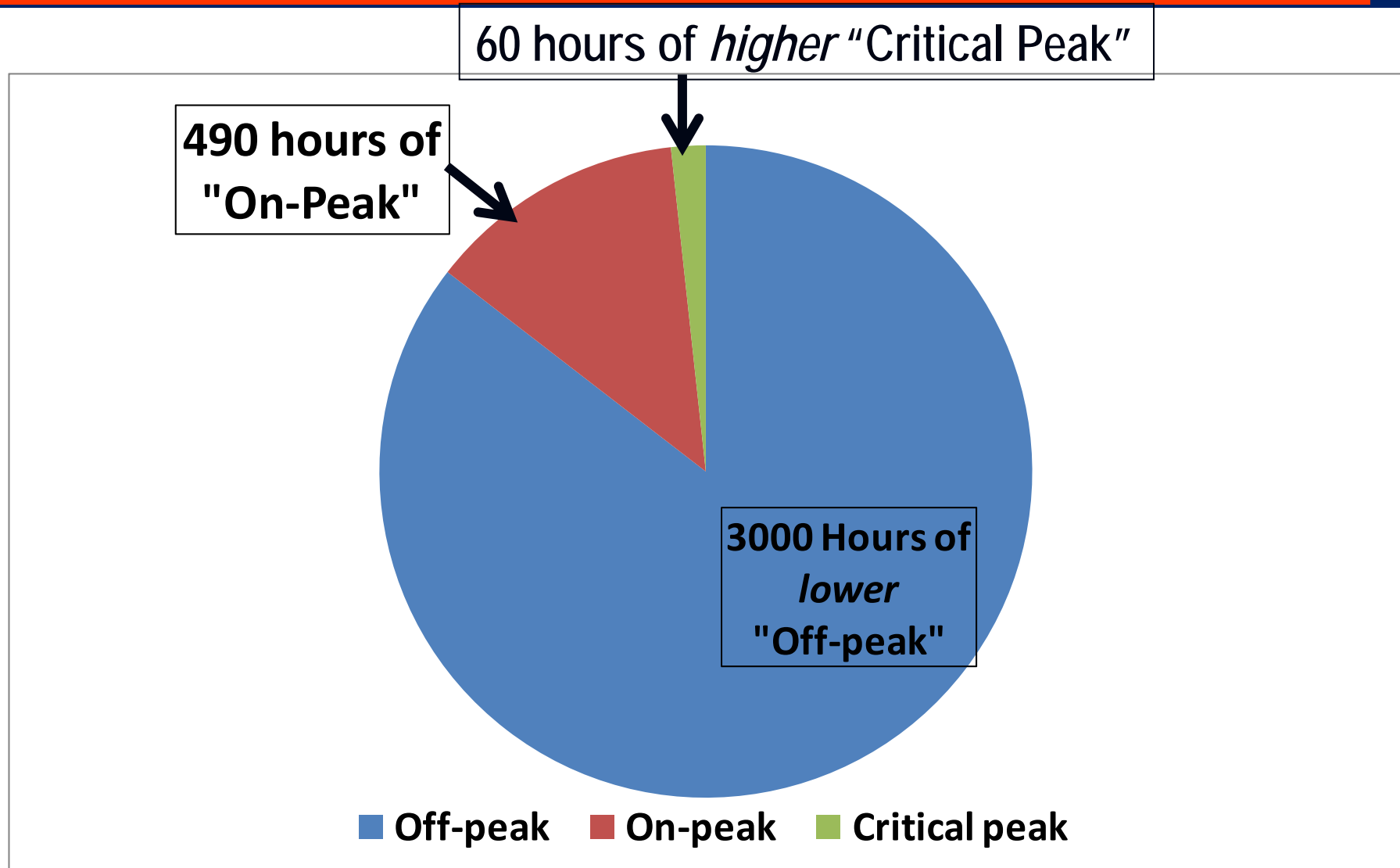
Peak Time Rebate: Weekdays (excluding Holidays)



- Schedule R summer rates are \$0.14 / kWh for all summer hours
- Up to 12 critical peak days will be called by 6 p.m. the prior day
- Customers who use less during the critical period (2 – 7 p.m.) on any critical peak day will receive a rebate. Two levels being tested:
 - \$1.75/kWh and \$1.16/kWh

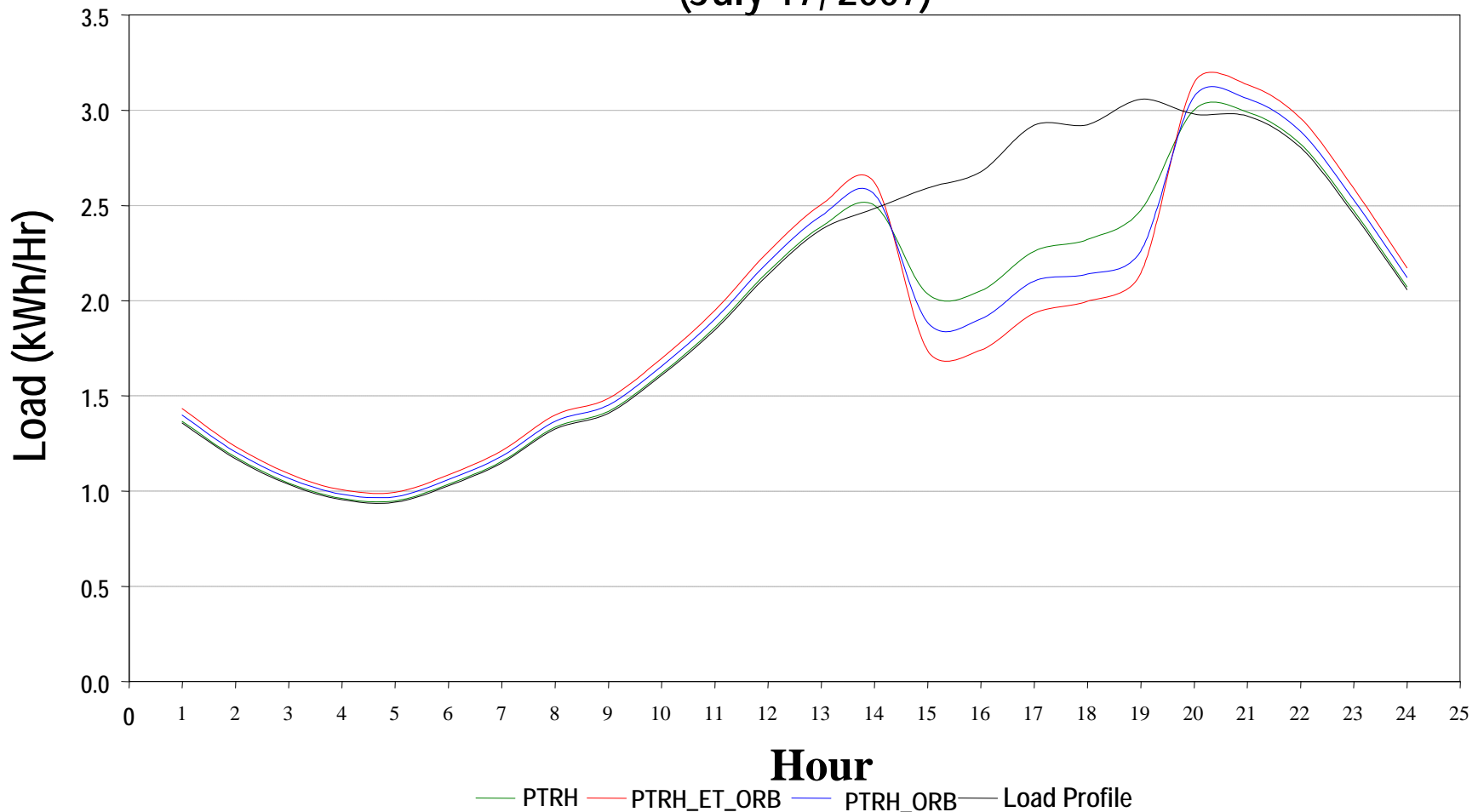


Hours in Each Summer Pricing Period



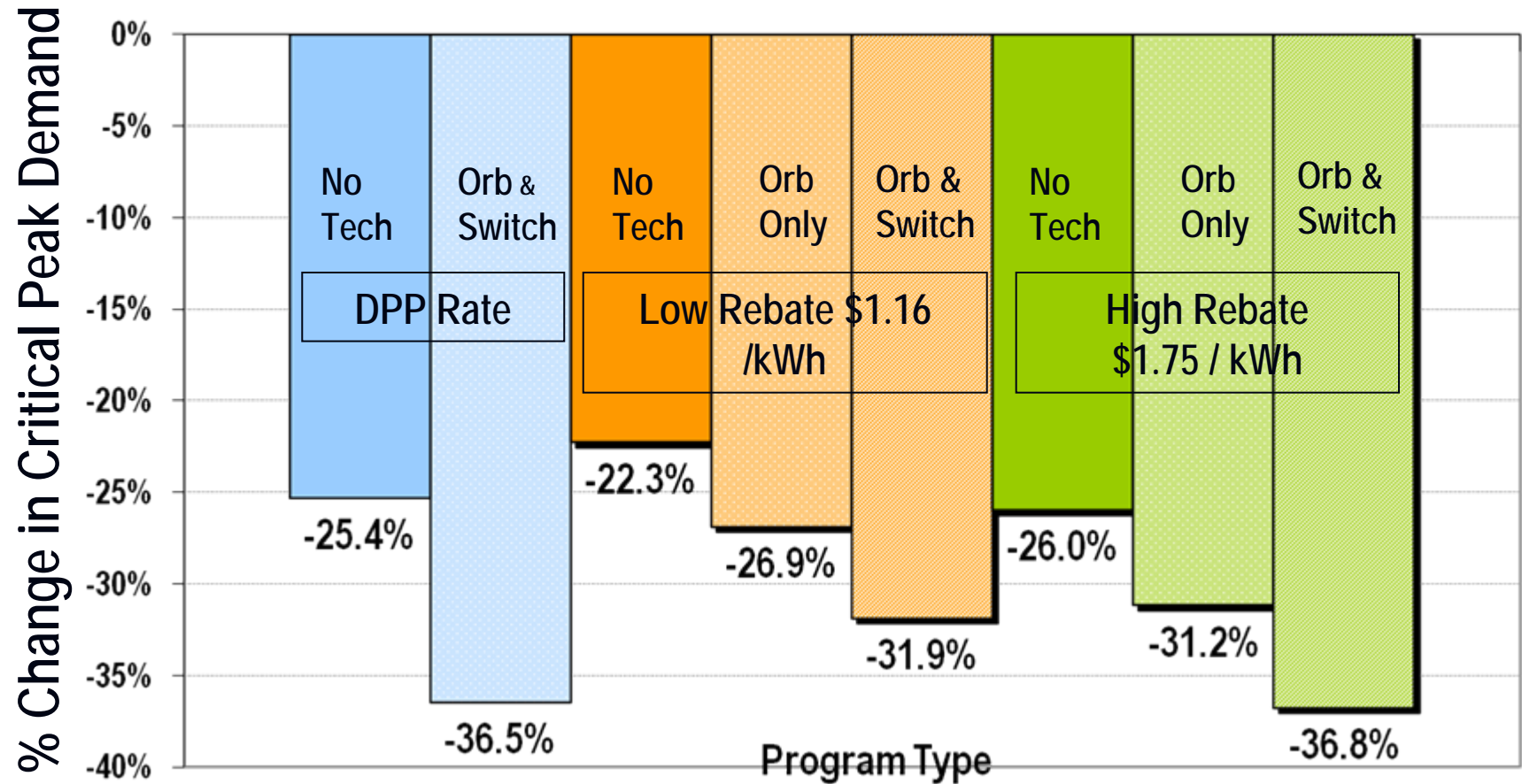
Actual Load Shapes for Participants and Control Group during Critical Peak Event

Load Profile on CPP Day before and after Demand Response
(July 17, 2007)

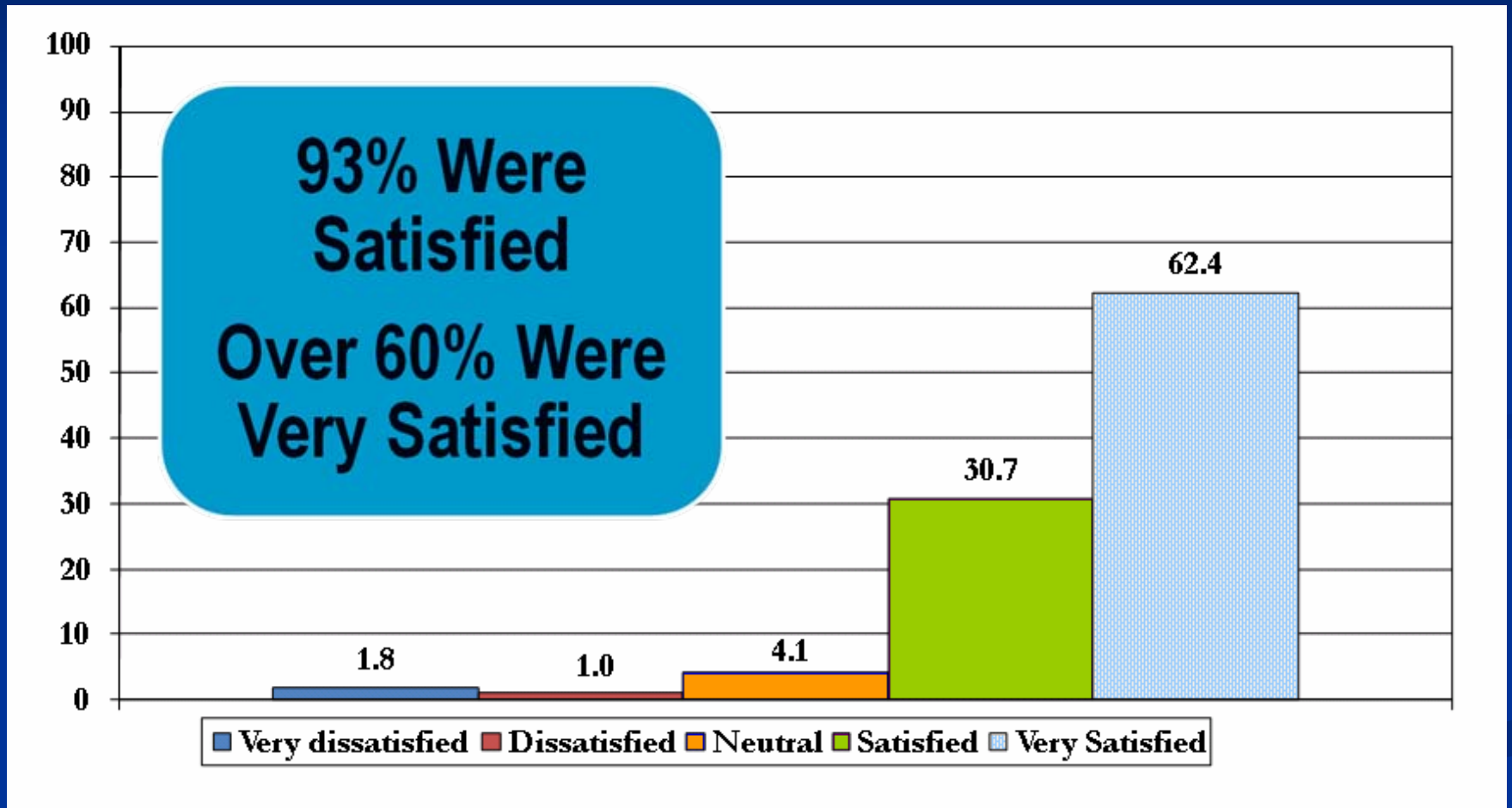


Summer 2008 Pilot Smart Energy Pricing - Peak Demand Reductions *

Average Customer



Customers Were Satisfied with Smart Energy Pricing!

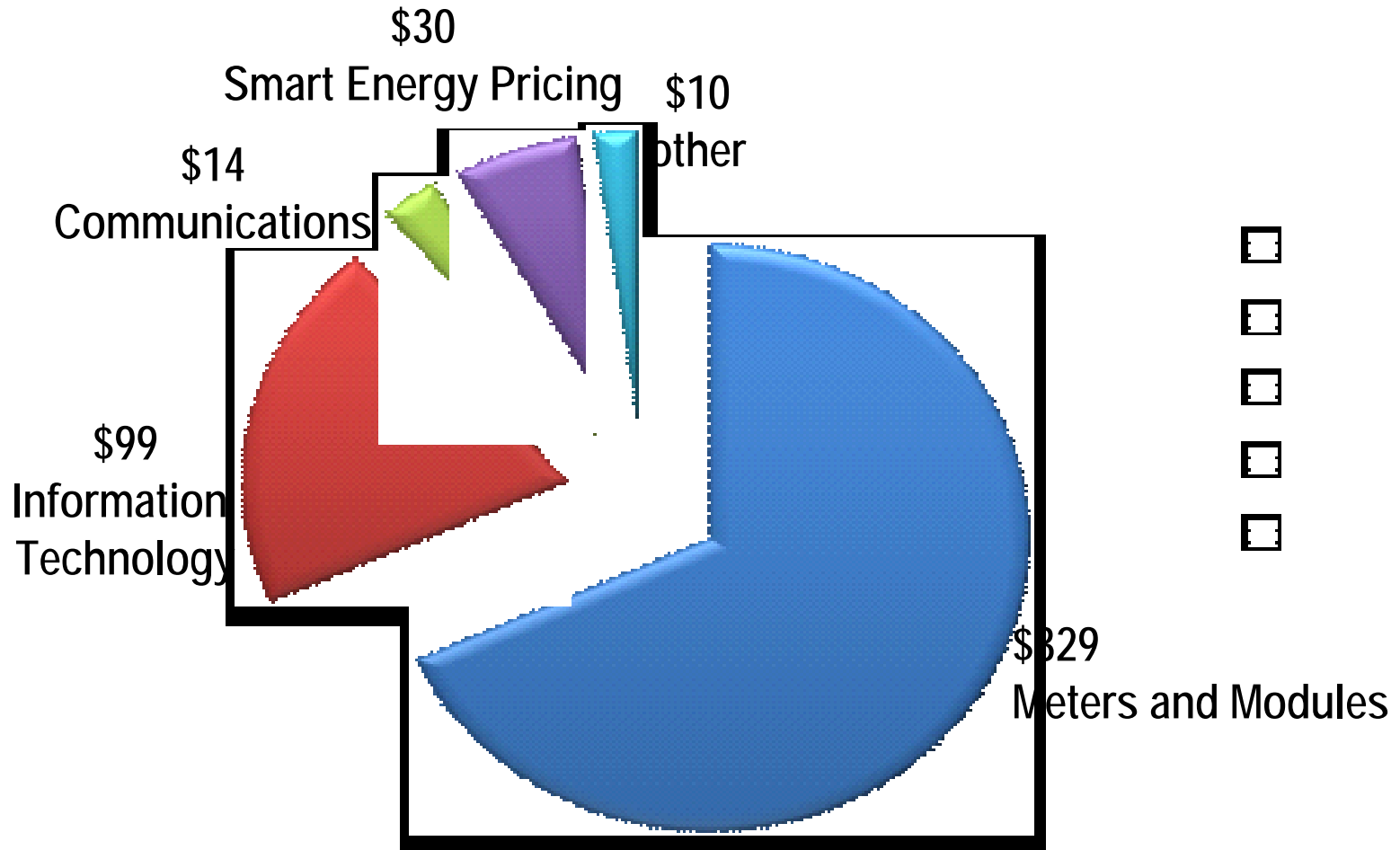


On a scale of 1 to 5, where 1 is "Very Dissatisfied" and 5 is "Very Satisfied", please rate your overall satisfaction with the pilot program. (77% response rate)

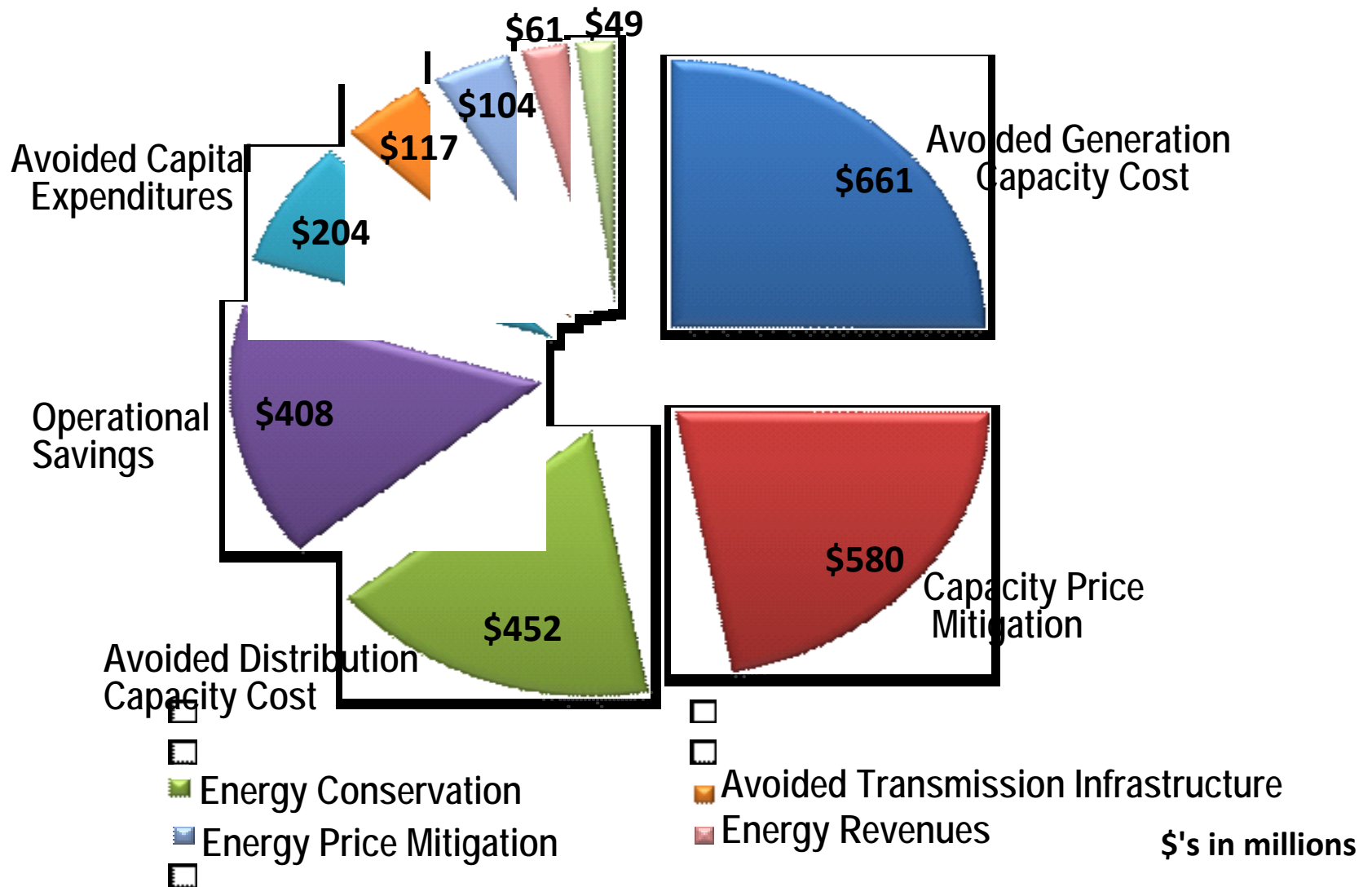


Estimated Deployment Costs

\$ 482 Million (2009-14)

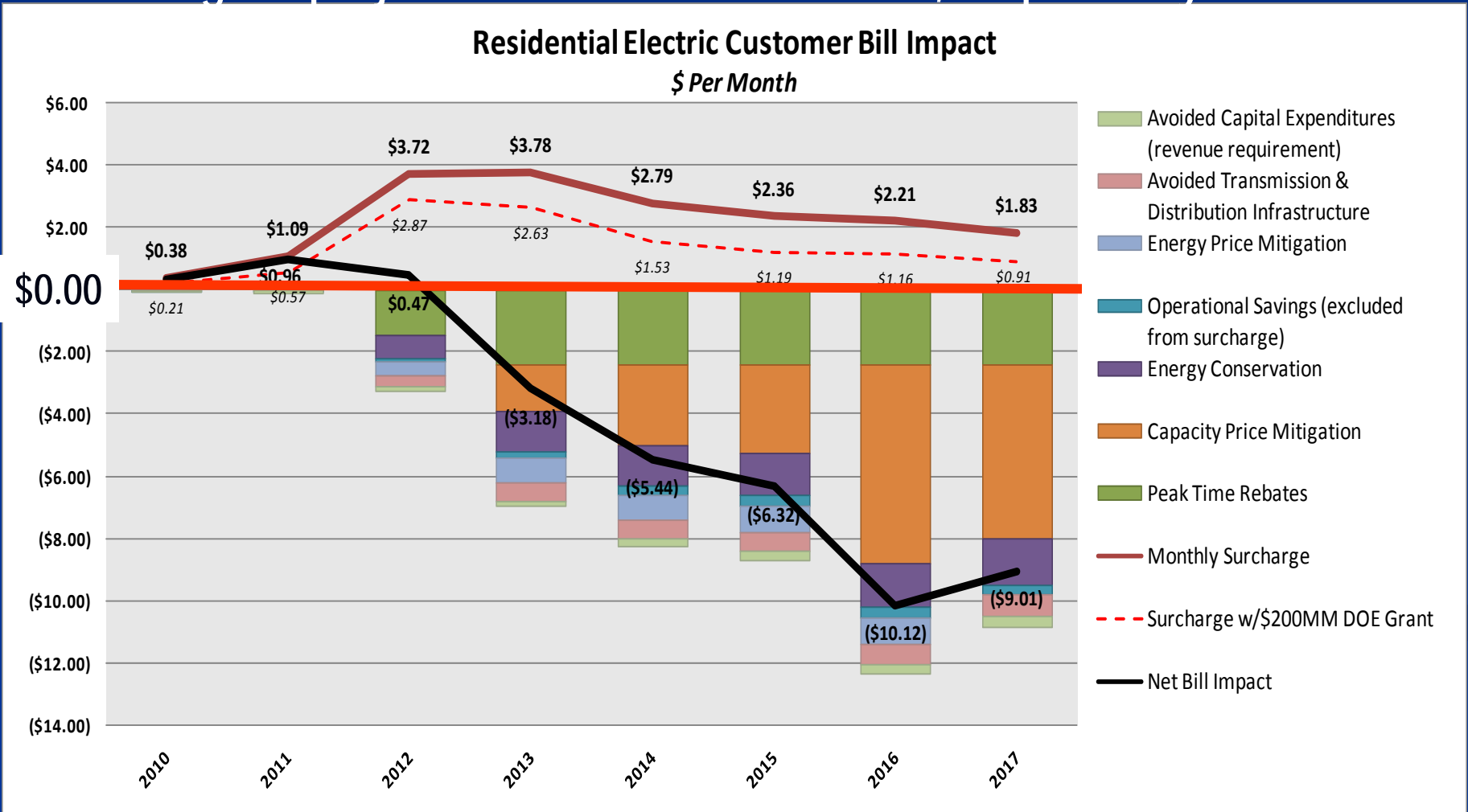


Customer Savings Greatest Benefit Projected Life-cycle Saving >\$2.6 B



Residential Bill Impact

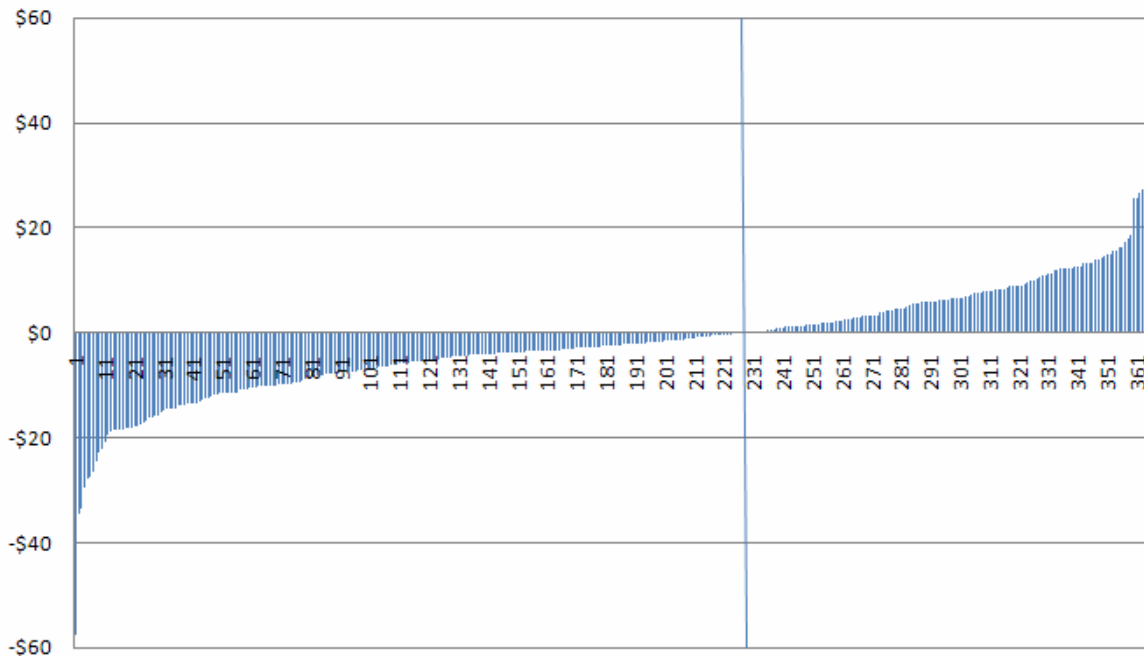
Over the life of the recovery period, the average monthly electric and gas surcharge is projected to be \$1.24 and \$1.52, respectively



Control Group Bill Impacts

$$\text{Summer Generation Impact} = \text{Proposed TOU Rate} - \text{Current Rate}^*$$

Control Group Schedule R
Proposed TOU Rates - Current Rate
June 1 - Sept 30, 2008



On Peak: \$0.16582 / kWh
(Summer Non-holiday
Weekdays 2-7 pm)

Off Peak: \$0.10690 / kWh
(All other times)

Largest increase: \$32 or 3.7%

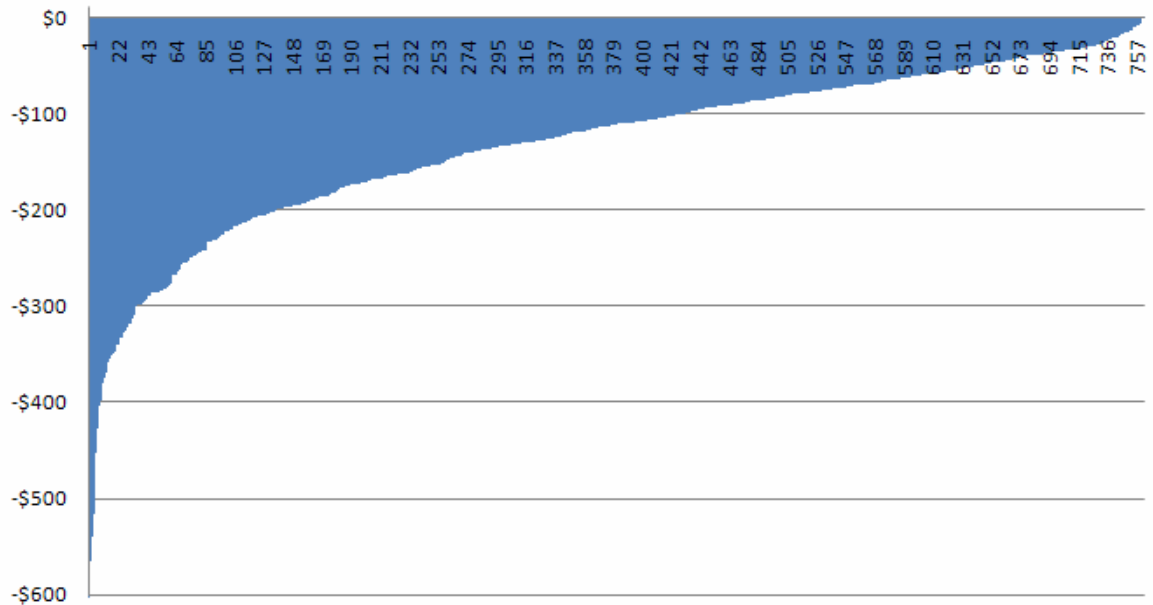
Largest decrease: \$58 or 5.2%

** Summer Generation rates are compared*

Proposed TOU Rates Are Revenue Neutral

With Earned Rebates Added All PTR Customers are Winners

**PTR Customers
Proposed TOU Rates - Current Rate
Rebates Excluded
June 1 - Sept 30, 2008**



Once rebates have been added, all Peak Time Rebate customers would save money under the proposed TOU rates.

On Peak: \$0.16582 / kWh
(Sum'r Non-holiday Wkdays 2-7 pm)

Off Peak: \$0.10690 / kWh
(All other times)

*Average summer savings: \$131
Decreases range from
\$1.44 to \$681*

PTR Customers All Save Under TOU with Rebates

Additional Smart Grid Benefits

- **Climate change** - *Greenhouse Gas Reductions*
 - Integrate huge influx of new renewables and storage devices
 - Support increased use of demand-side resources
 - Reduce overall energy consumption by providing consumers with direct feedback on their usage
- **Energy independence** - *Reduce dependence upon foreign sources of energy and promote electric transportation*
 - Integrate the demands and benefits of electric transportation
 - "Smart Charging" avoid new peaks due to night time vehicle charging

OPTIMIZE the electric system for
benefit of all consumers

MAXIMIZE the benefits from all the new
technology investments