

Demand Response Enabled Appliances – Key to the Smart Home

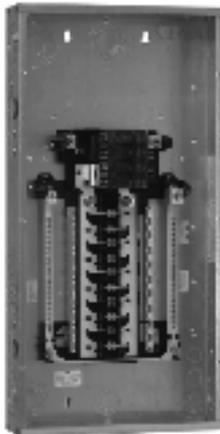
David Najewicz

General Electric Consumer and Industrial

June 8 2009

Santa Clara CA

GE Consumer & Industrial



World Class Manufacturer of Consumer Products:
Lighting, Appliances, Electrical Distribution Equipment

GE consistently outperforms the rest of the appliance industry

- 2008 revenue — \$7 billion
- Global presence
- Five appliance brands serving the U.S. market
 - GE Monogram™
 - GE Profile™
 - GE Café™
 - GE®
 - Hotpoint®



Consumers prefer GE

- America's #1 preferred appliance brand for nine years in a row*
- GE is ranked 4th as the world's most valuable brand**

BusinessWeek Top 100 Global Brands

Top 100 Global Brands Scoreboard

2007 Brand Rank	Brand Name	2007 Brand Rank	Brand Name
1	Coca-Cola	6	Toyota
2	Microsoft	7	Intel
3	IBM	8	McDonald's
4	GE	9	Disney
5	Nokia	10	Mercedes-Benz

Source: Businessweek.com

*Harris Poll 2006

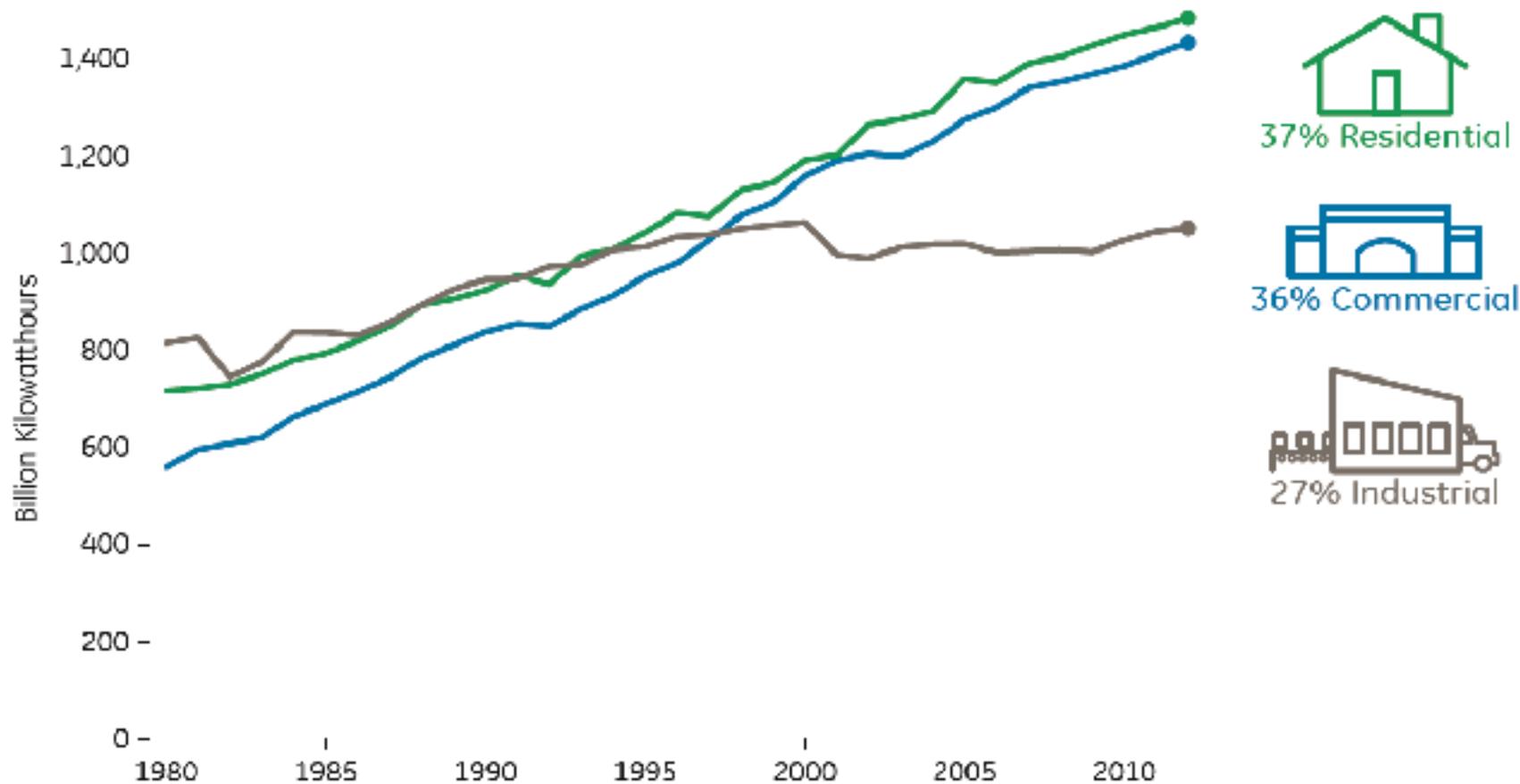
**Business Week 2007

ENERGY STAR® partner of the year

- ENERGY STAR is a government- sponsored program to help consumers identify products with the highest energy and environmental performance
- GE won the ENERGY STAR Partner of the Year award in household appliances for 2004, 2005, 2006, 2007, 2008, and 2009.



2012 Demand



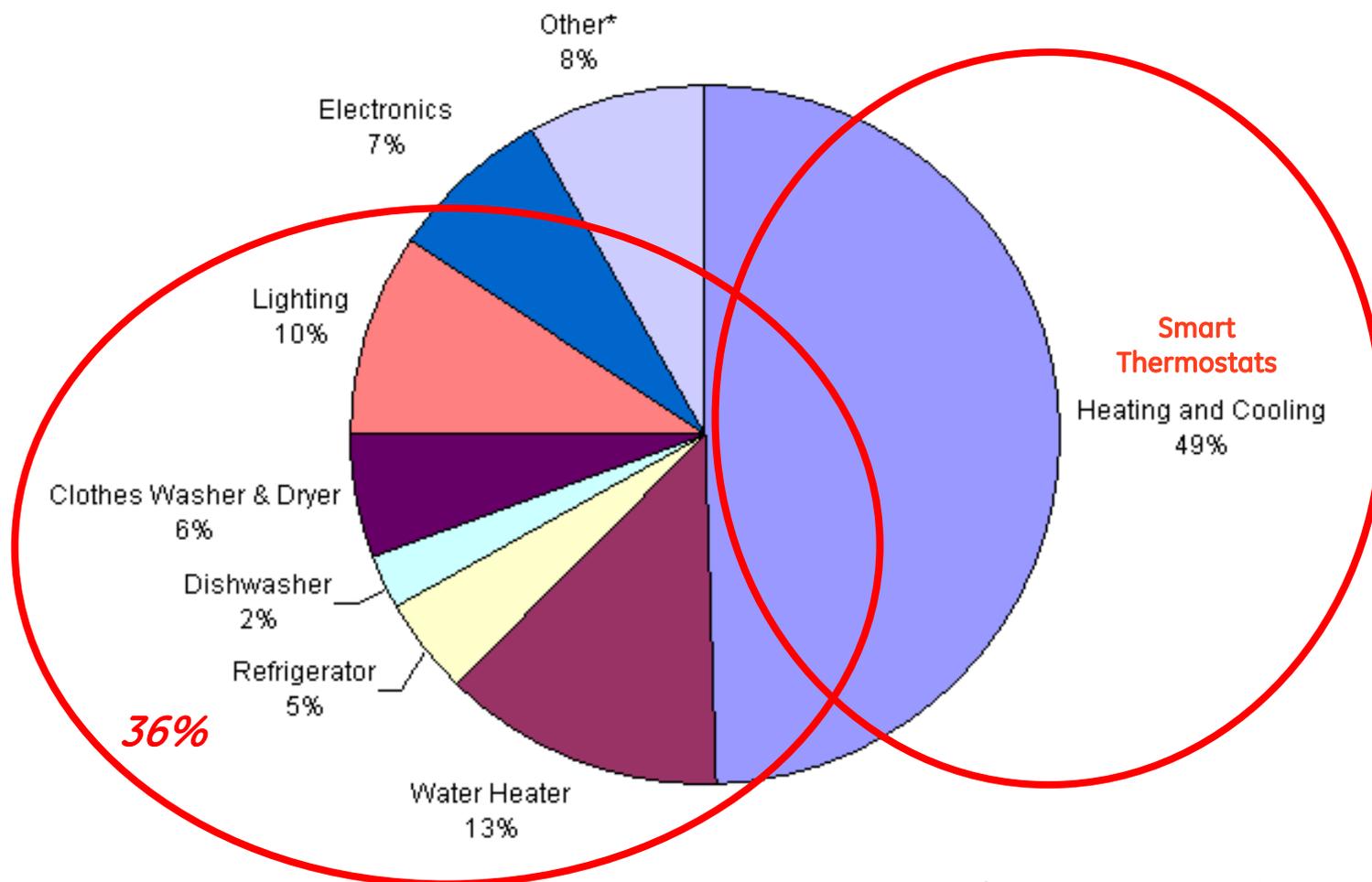
Source: EIA, AFR 2007.

Major trends in the Utility Industry

- Demand is outpacing supply in certain locations and at peak times
- Legislation and costs are delay/stopping new power plant construction
- Smart meters (AMI) are being deployed in significant numbers
- Pricing legislation (Tiered and TOU) will drive consumer behavior



Appliances & Lighting Energy as a Percentage of Household Energy Usage



Energy Efficiency

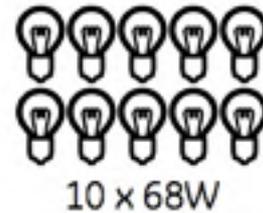
Good progress has been made on product efficiency.

Average Energy



Refrigerator

Peak Power



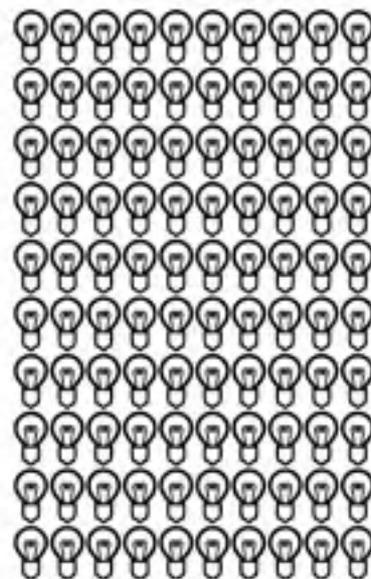
Energy Efficiency

New solutions needed to address peak loads.

Average Energy



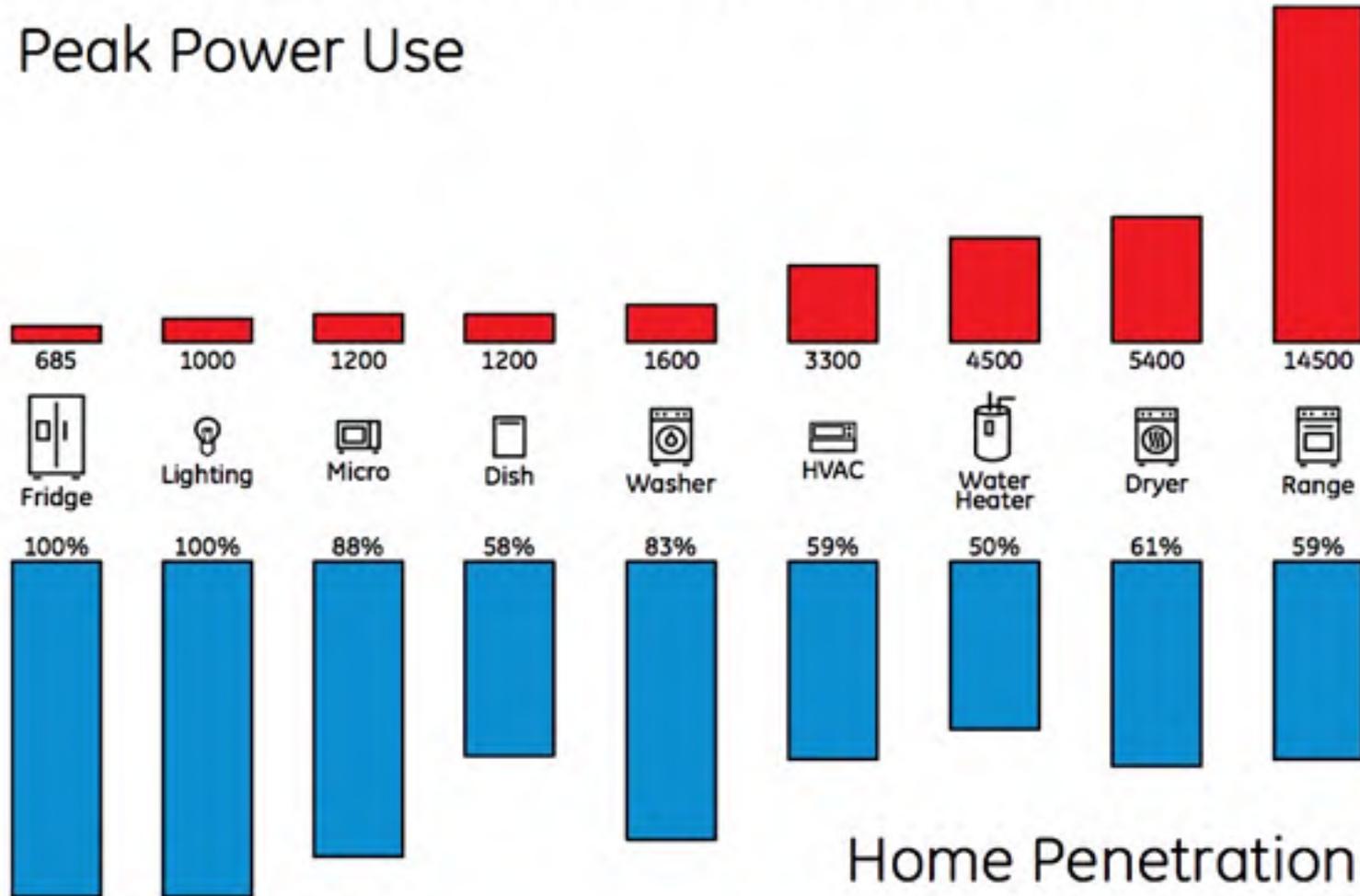
Peak Power



100 x 100W

Peak Potentials

Peak Power Use

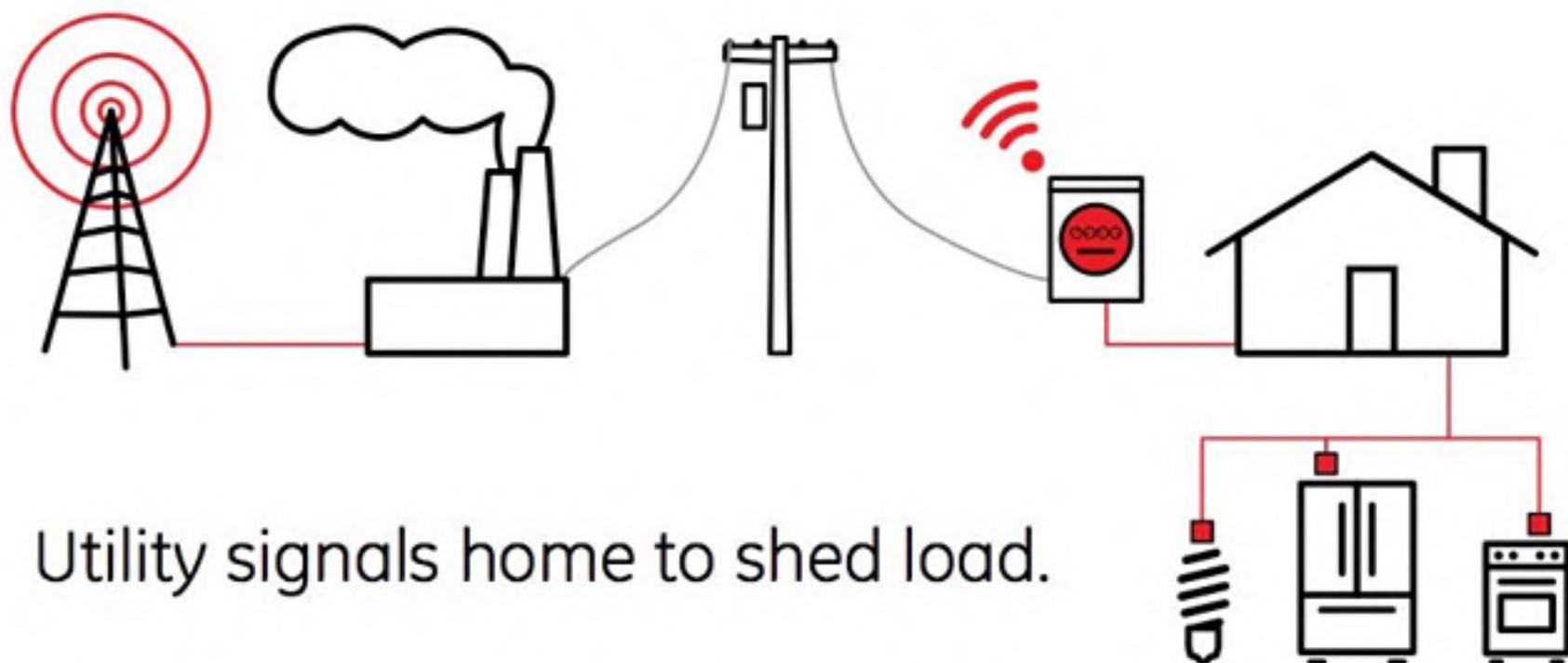


Home Penetration

Source: EIA, AER 2007.

Electric Products Only

Manage the Load



Utility signals home to shed load.

GE Smart Home

Smart Grid + C&I DSM Enabled Products



Appliance Peak: 30 kW

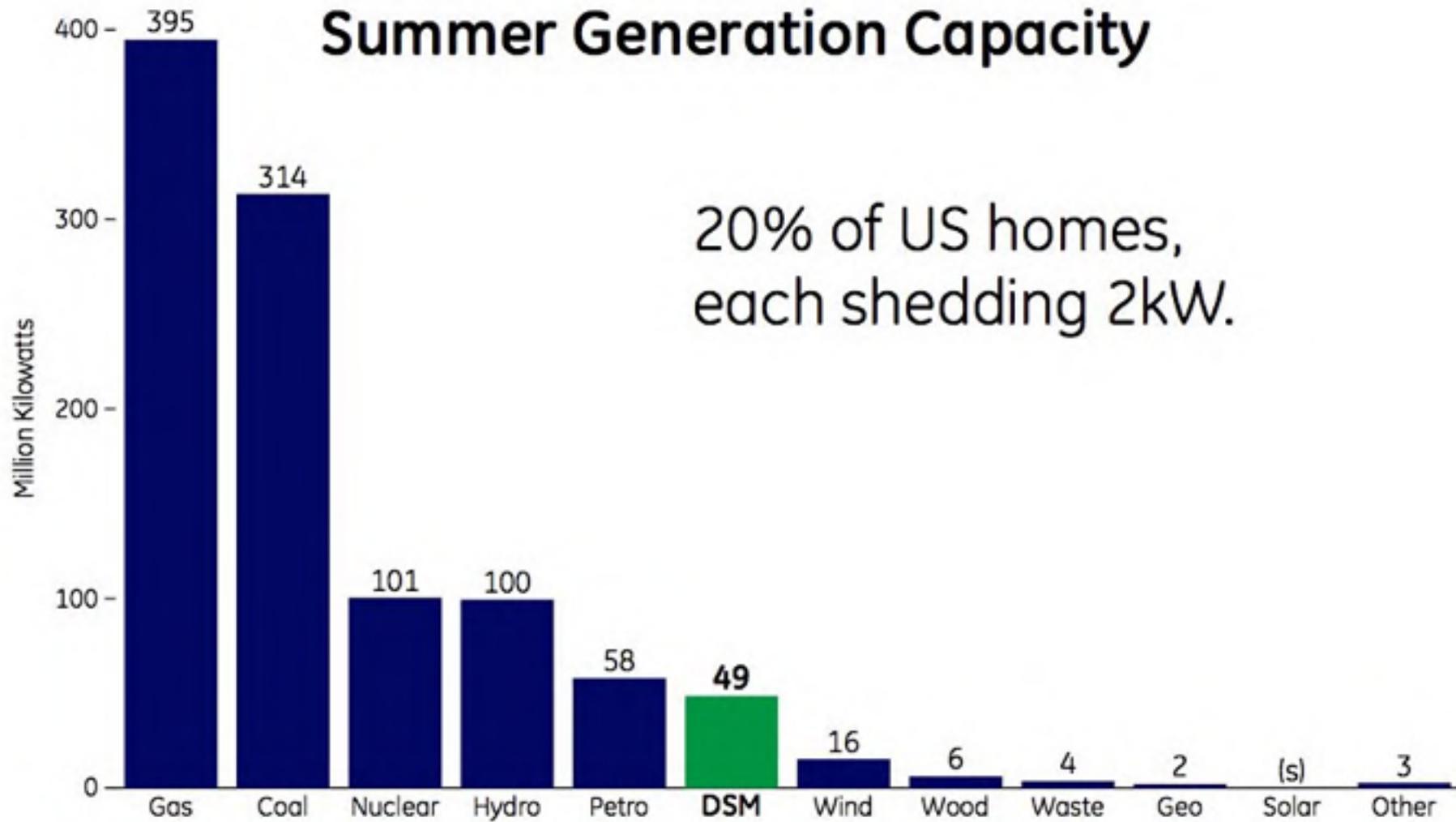
Desired Shed: 20%

Load Reduction: 2 kW minimum

HVAC Peak: 3.3 kW

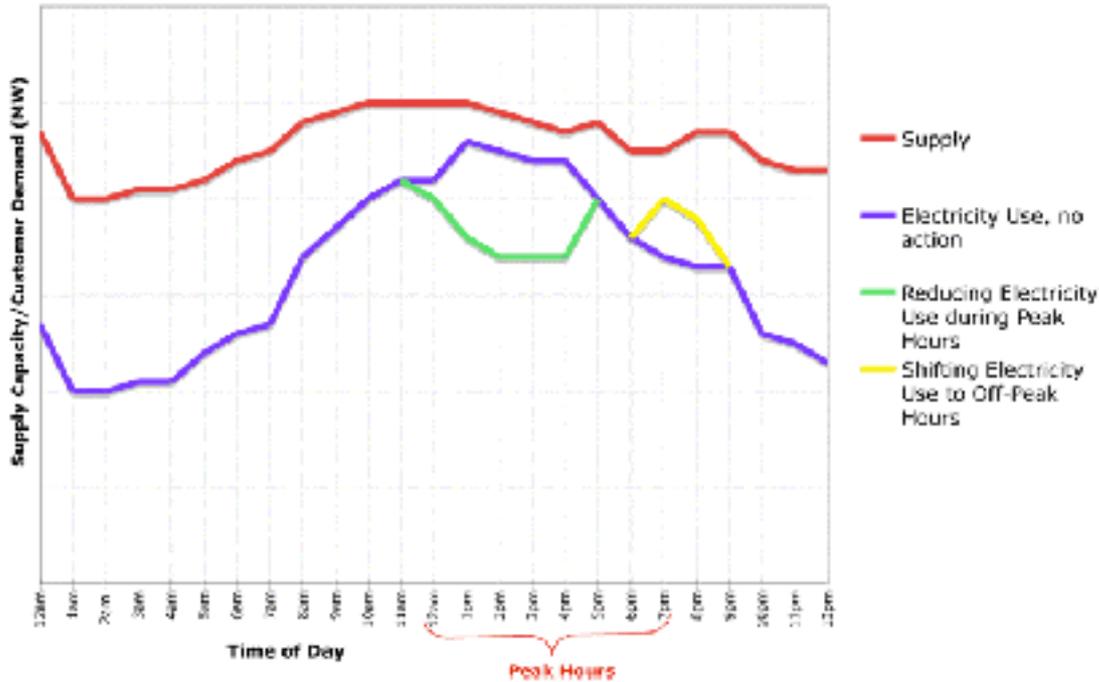
Impact

Summer Generation Capacity



20% of US homes,
each shedding 2kW.

Utility Perspective

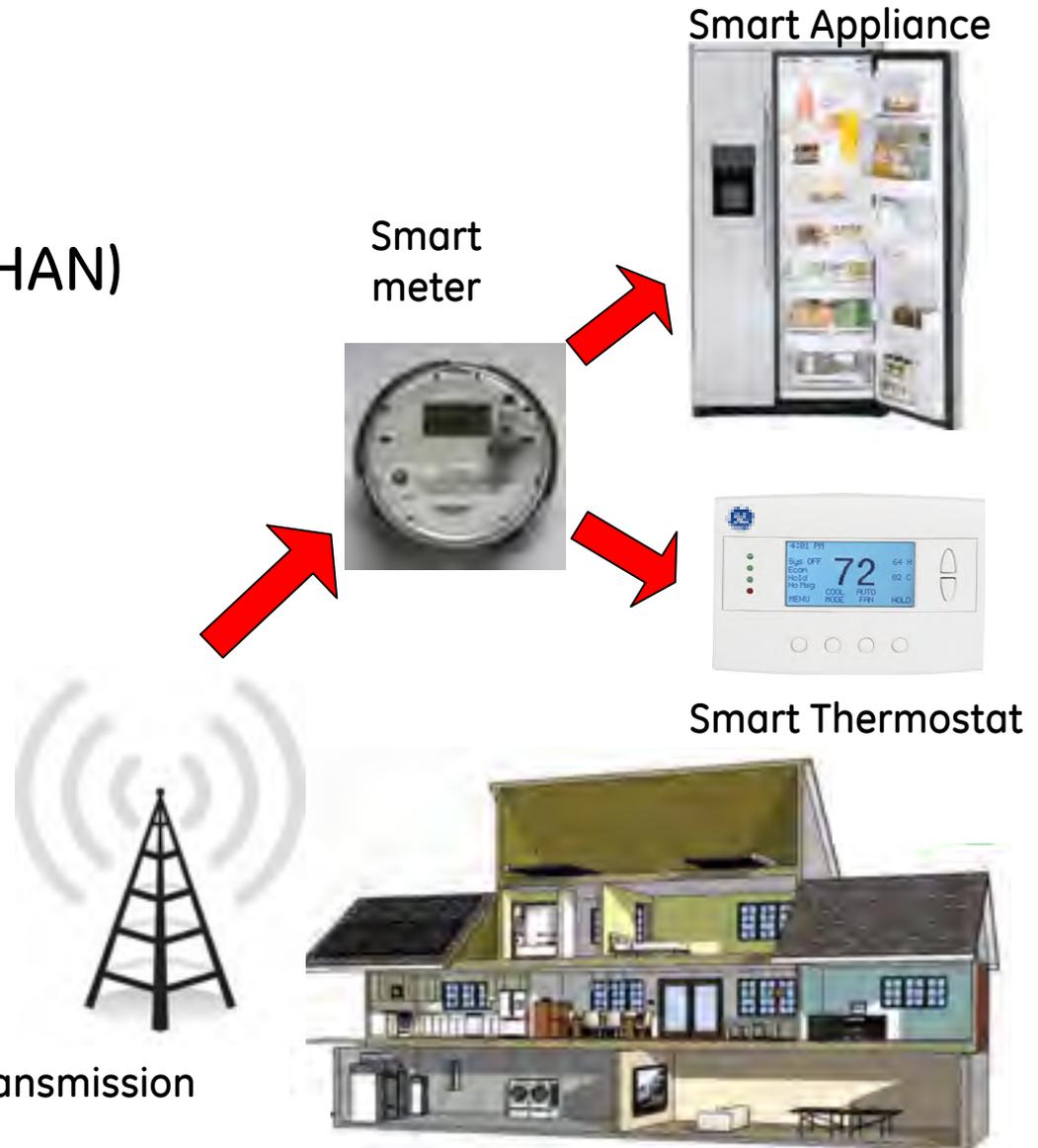


DR Enabled Appliances

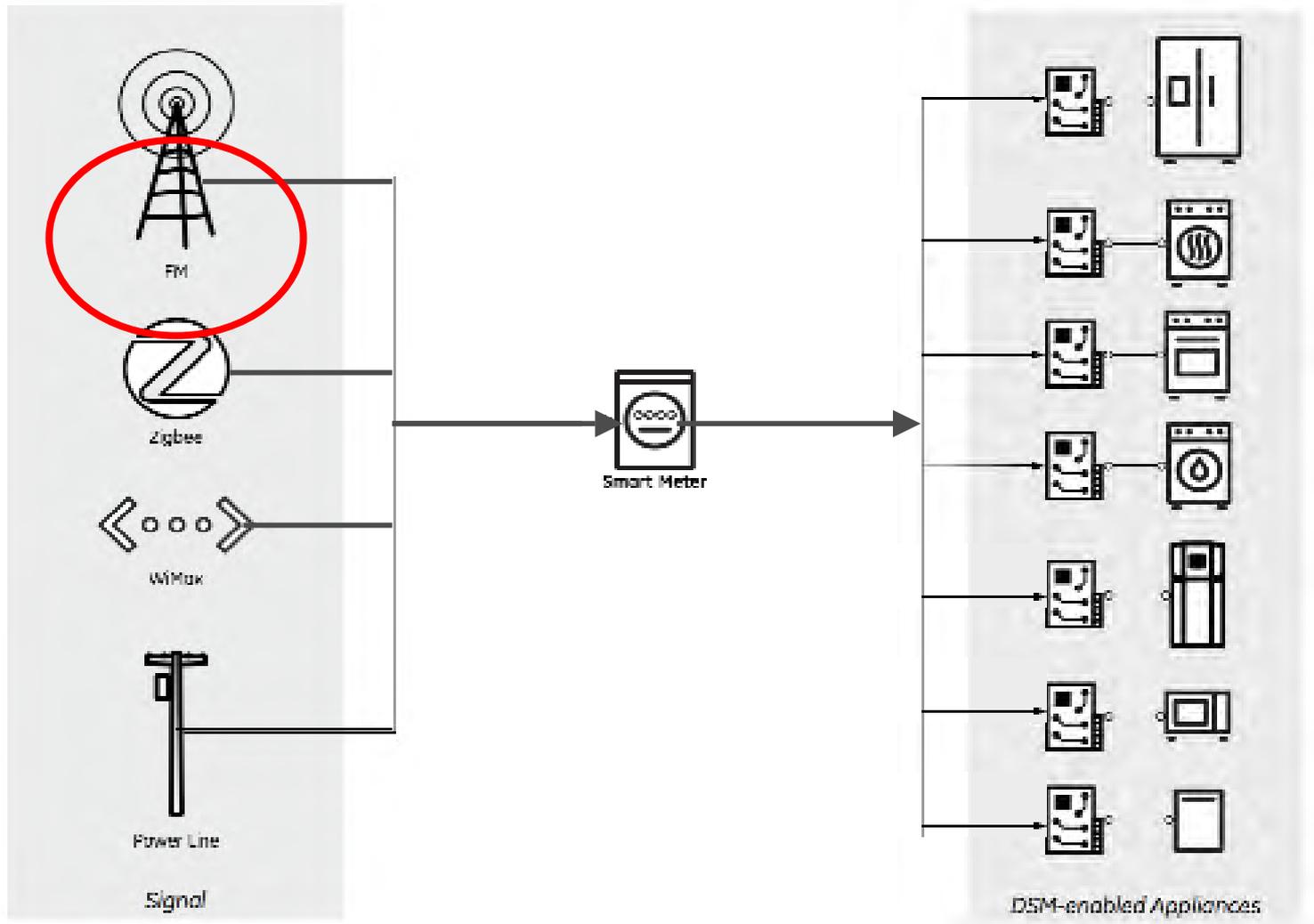
Demand Reduction During Peaks is Important

Utility Communication

- Smart Meter
- Home Area Network(HAN)
- Smart Appliances
In Home Display



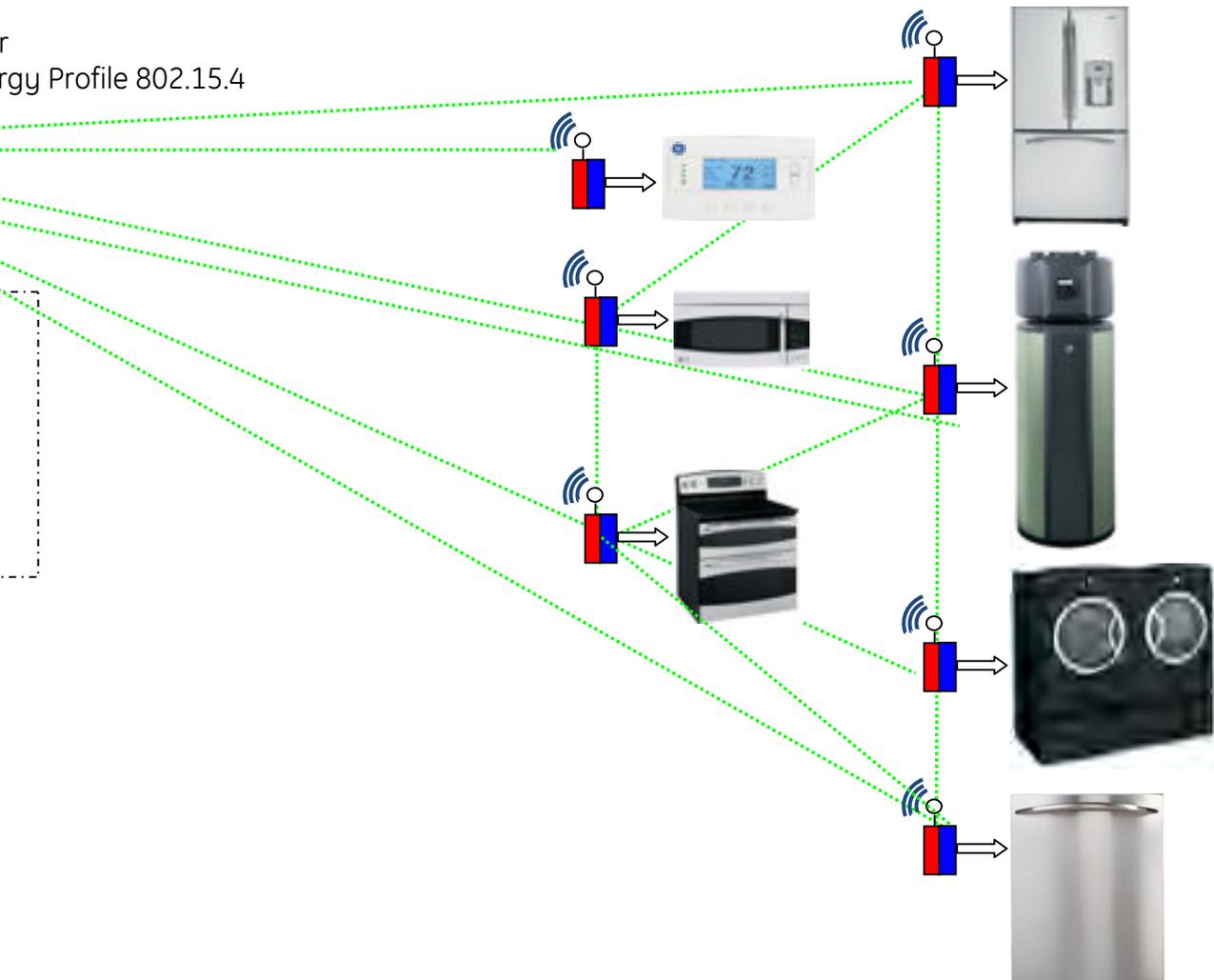
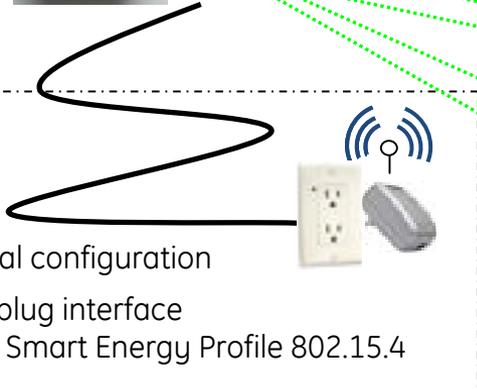
DR System Diagram - Gen 1



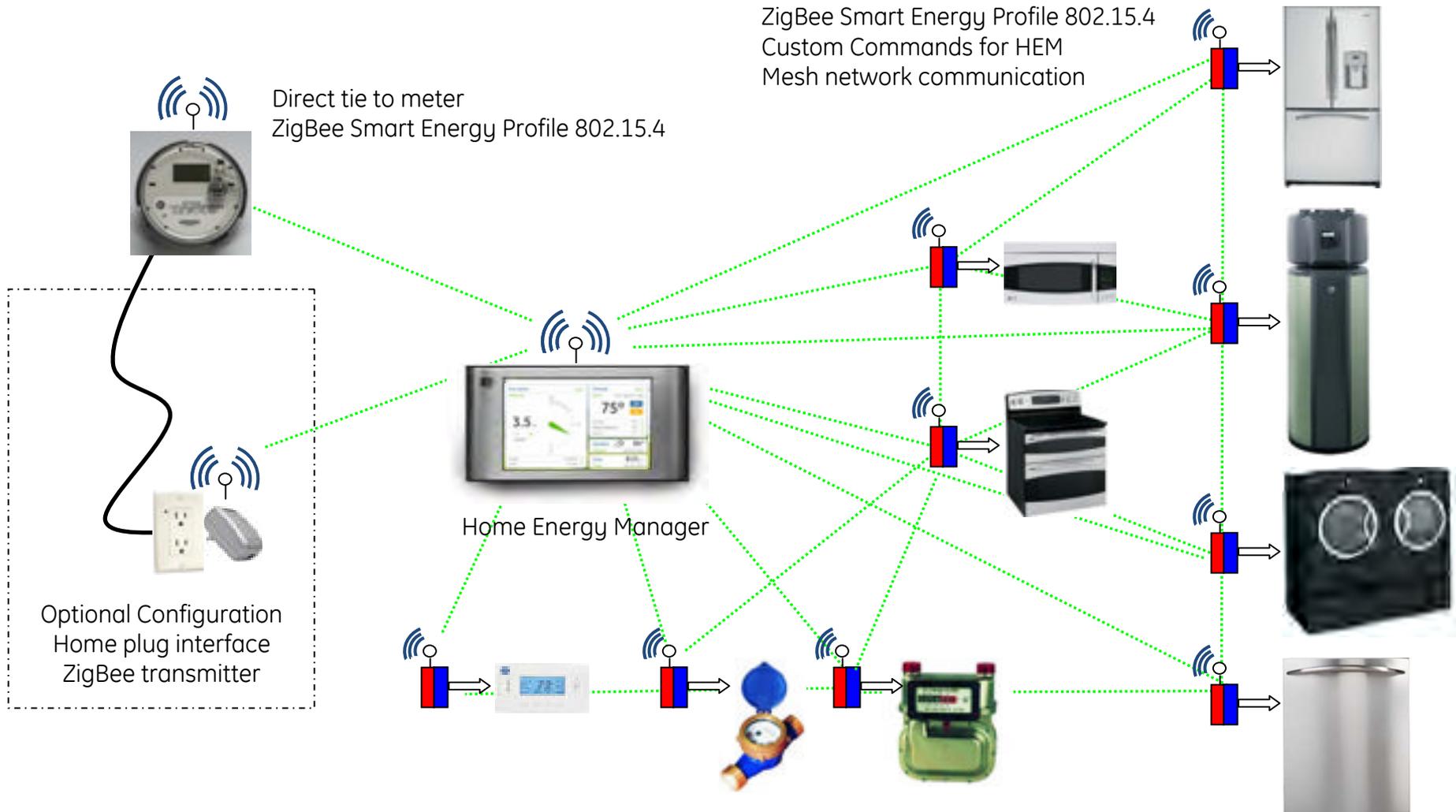
H2G --2009



Direct tie to meter
ZigBee Smart Energy Profile 802.15.4



H2G - Home Energy Manager / DR Configuration 2010



H2G - DR E-Radio

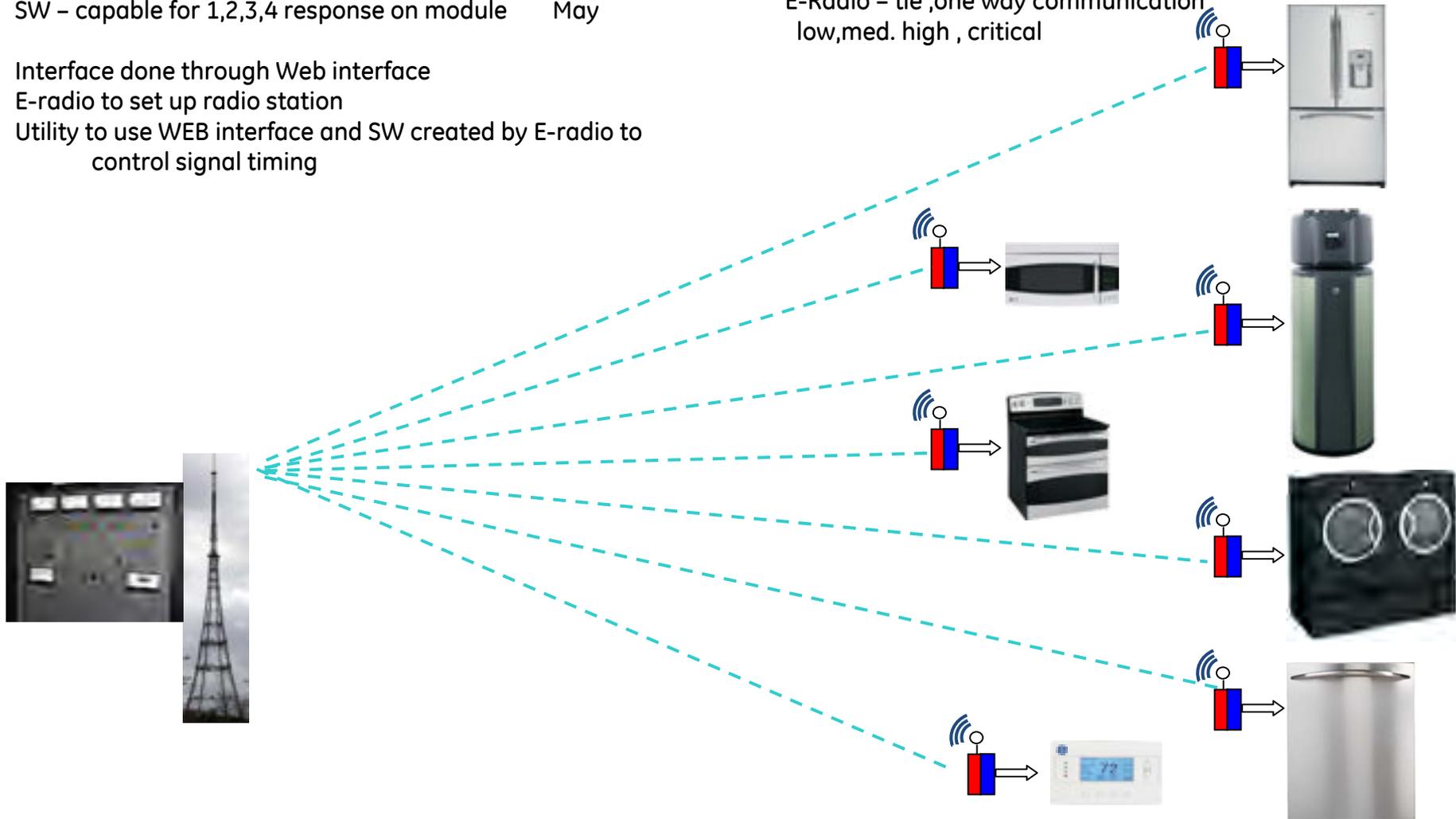
SW - capable for 1,2,3,4 response on module May

Interface done through Web interface

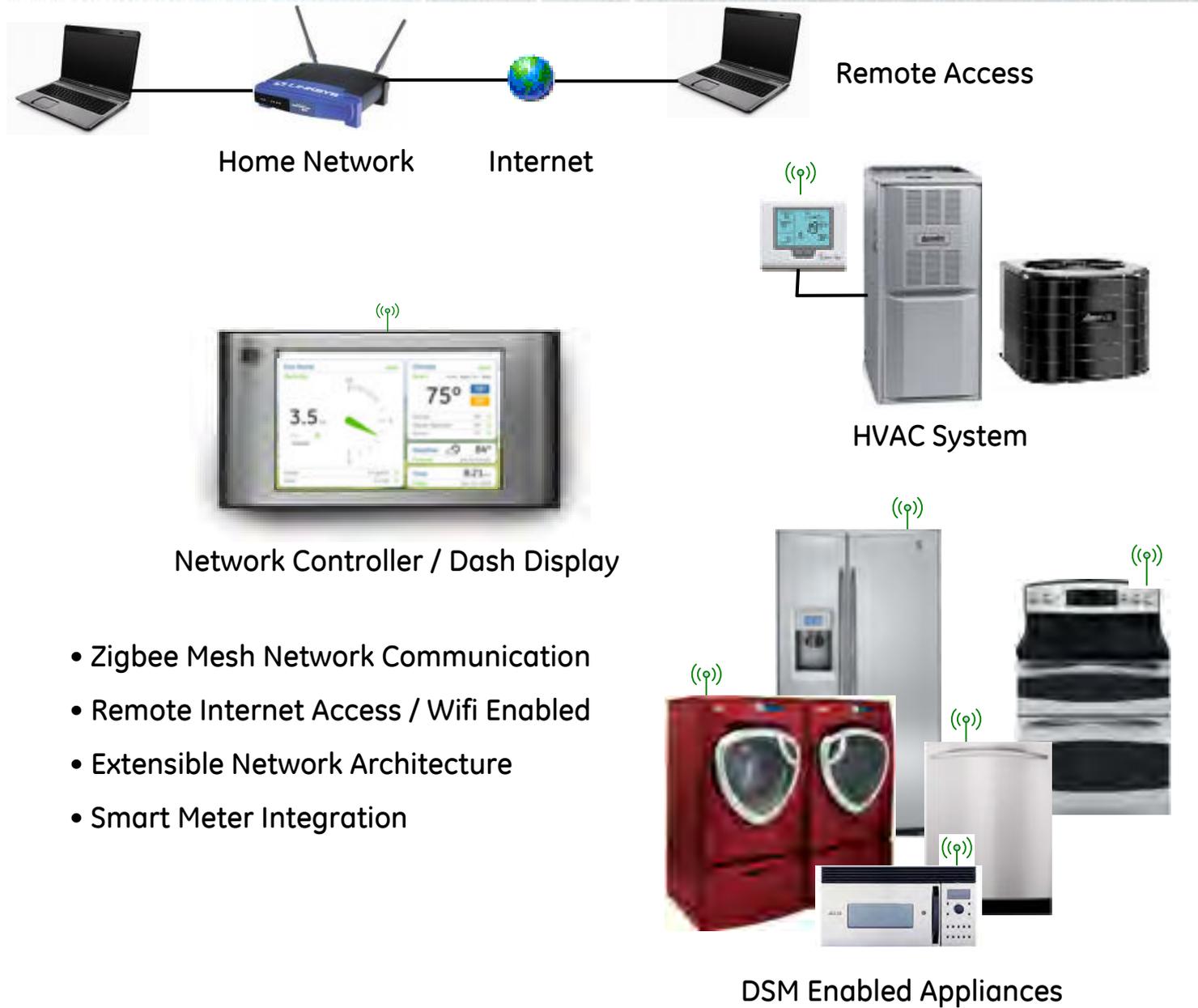
E-radio to set up radio station

Utility to use WEB interface and SW created by E-radio to control signal timing

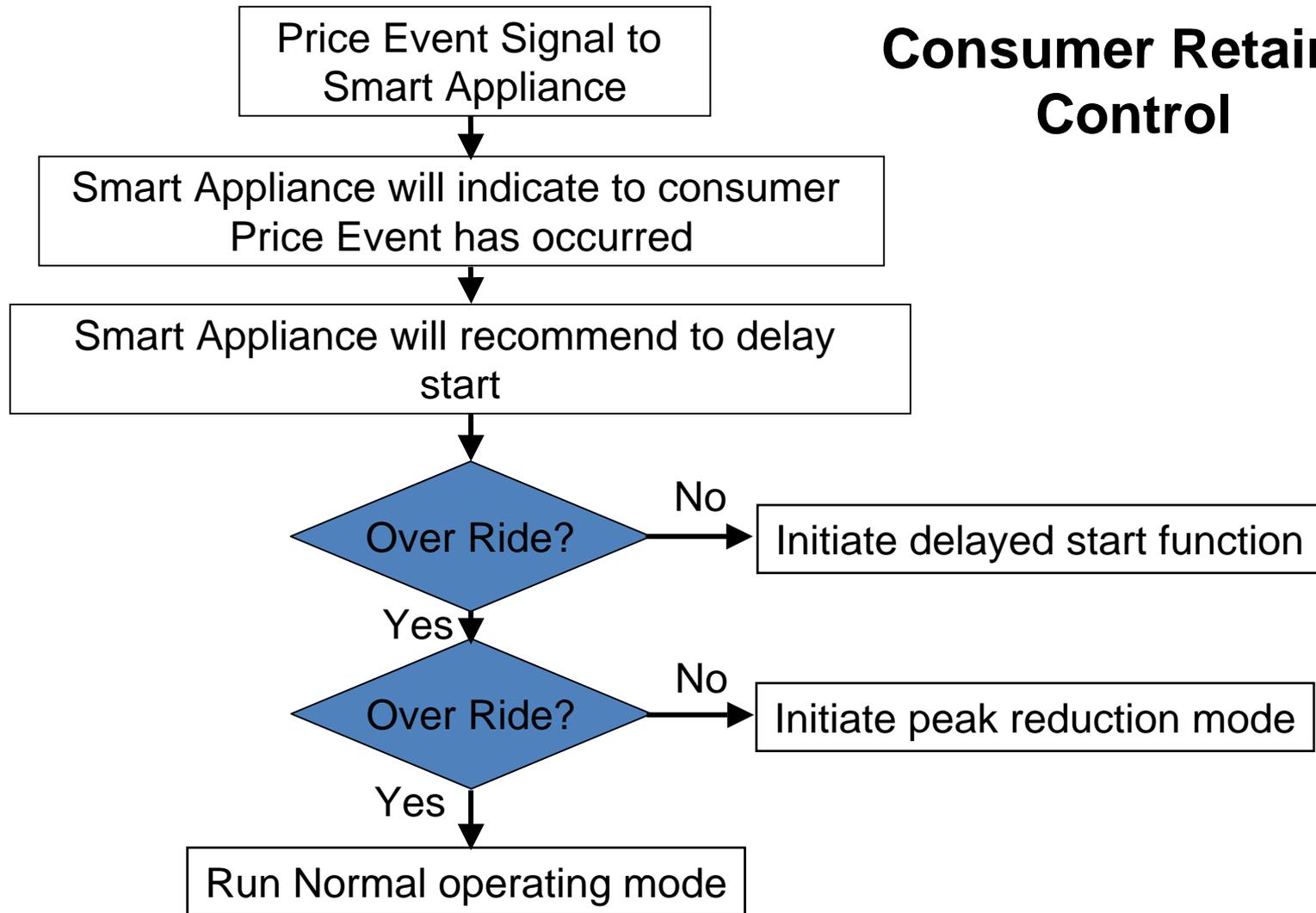
E-Radio - tie, one way communication
low, med. high, critical



Home Energy Manager - Vision



Consumer Retains Control



Home to Grid (H2G) Appliance Response

Demand Response (DR) – Energy Star

- Delay defrost
- Modification of run time during peak
- Reduced features during peak
- Energy saver mode – temperature shift



Refrigerator

H2G Appliance Response

Demand Response (DR) - Energy Star

- Delayed wash
- Modified cycle time
- Manage water usage
- Energy saver mode – smarter cycles



Dish Washer

H2G Appliance Response

Demand Response (DR) - Energy Star

- Delayed wash and dry
- Modified cycle time
- Manage water usage- cold wash
- Energy saver mode – smarter cycles



Washer and Dryer

H2G Appliance Response

Demand Response (DR)

- Reduced energy cooking
- Use of small cavity
- Cooking efficiency
- Electronic cook top



Range and Microwave

Hybrid Water Heater: Launch 2010



Energy Efficiencies

- Uses heat pump technology to generate energy savings of ~ 2500 kWh per year (uses 2300 KWH per year vs. standard 50 gallon 4800 kWh per year)
- EF rating of ~ 2.0 compared to .90-.93 standard electric water heater.
- DR-enabled. Uses 800 W in peak mode vs. 4500 W in standard electric mode.

Convenience

- Similar installation as a standard water heater
- 50 gallon capacity



ecomaginationSM

H2G Smart Thermostat

Demand Response (DR)

- Fully programmable Thermostat
- Screen selection

\$KWh Usage

Instantaneous KWh

Instantaneous \$Pricing



Smart Thermostat

HEM - SMART ADVANTAGE

Advanced algorithmic based system

- Peak energy manager/scheduler
- \$ manager for energy
- Weather forecast Advanced algorithms
- Advanced Power management with solar
- Advanced management setting for appliances
- Energy saver mode
- Vacation mode



Home Energy Manager (HEM)

Why Consumers Purchase Appliances

Today's Purchase Decision Equation

Purchase Decision = f (Appearance) + f (Features) + f (Speed) + f (Price)

Smart Grid Purchase Decision Equation

Purchase Decision = f (Appearance) + f (Features) + f (Speed @ times)

+ f (Energy Management Flexibility @ times)

+ f (Ability to save Money & Planet)

Education of Consumer is Critical

GE C&I Products – for Pilot Programs



Energy Monitor and Smart Thermostat – available 9/2009



Appliances Available July 2009

LG&E / GE Pilot Program



- 46 DR Appliances installed in 15 homes in Louisville (GE Employees)
- 4 months of field experience
- Initial survey completed
- 2 Focus Group sessions
- Data collection underway

LG&E / GE Pilot Program



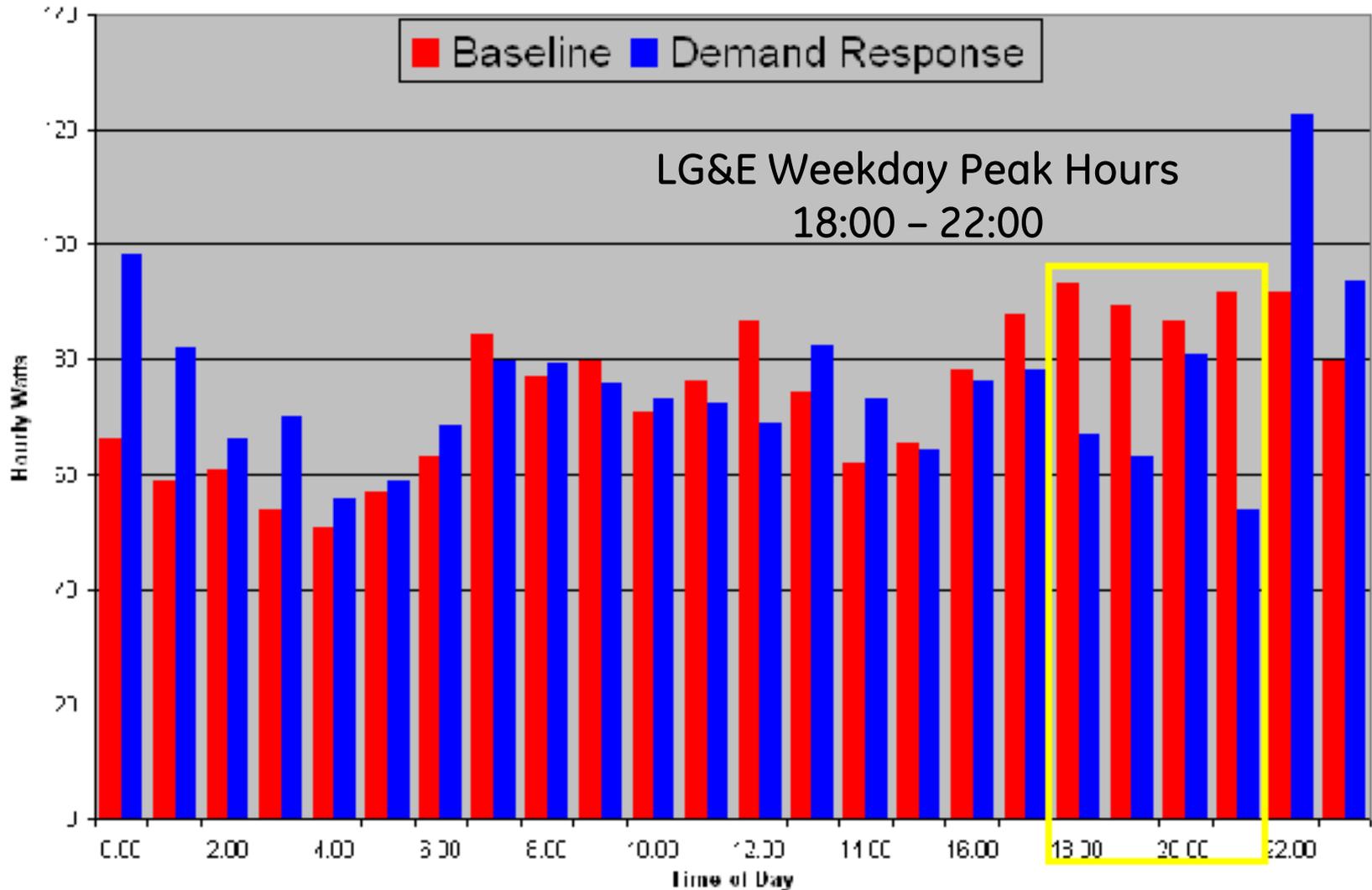
Survey Overview

- Gen1 product shedding load as expected
- Customers believe that they are saving money
- Customer behaviors are being modified

"it appears like I saved \$10-\$20 last month - some of that may be due to the energy mgmt system"

"I like the fact they interact with the LG&E meter to automatically make adjustments based upon the current rate period. That provides energy savings for me that I would have a difficult time duplicating otherwise."

Refrigeration Demo – 4 Homes



27% reduction during peak hours
6% reduction on daily cost

Thanks....

Questions, comments ?