Evaluation of Smart Grid Projects Presents Challenges, But Promises Rewards

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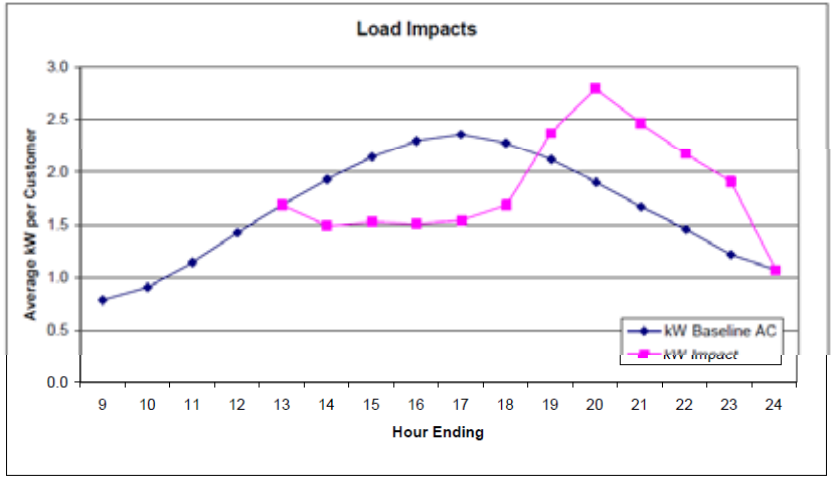
Three Residential Smart Grid Pilots

- Ongoing programs
  - Each in 2nd year (of 3-5 years)
  - Learnings are preliminary, but interesting
- Two from DSM evaluation perspective
  - 1. Deliver cost effective “AMI” with existing AMR
    - Customer broadband + smart grid HAN
  - 2. Examine technology options and combinations
    - Smart meters with broadband vs. backhaul + HAN
- One from customer perspective
  - 3. AMI + broadband + metering “overlay”

Traditional Evaluation is Expanding

- Process evaluation
- Impact evaluation
  - Demand
  - Energy

$$kWh_{jt} = \alpha_j + \beta \mathbf{X}_{jt} + \gamma_1 CDH_t + \gamma_2 Morn_{jt} + \gamma_3 kWhlagged_{jt} + \varepsilon_{jt}$$



- *Technology assessment*
  - Performance and reliability
  - Customer acceptance
  - Cost effectiveness

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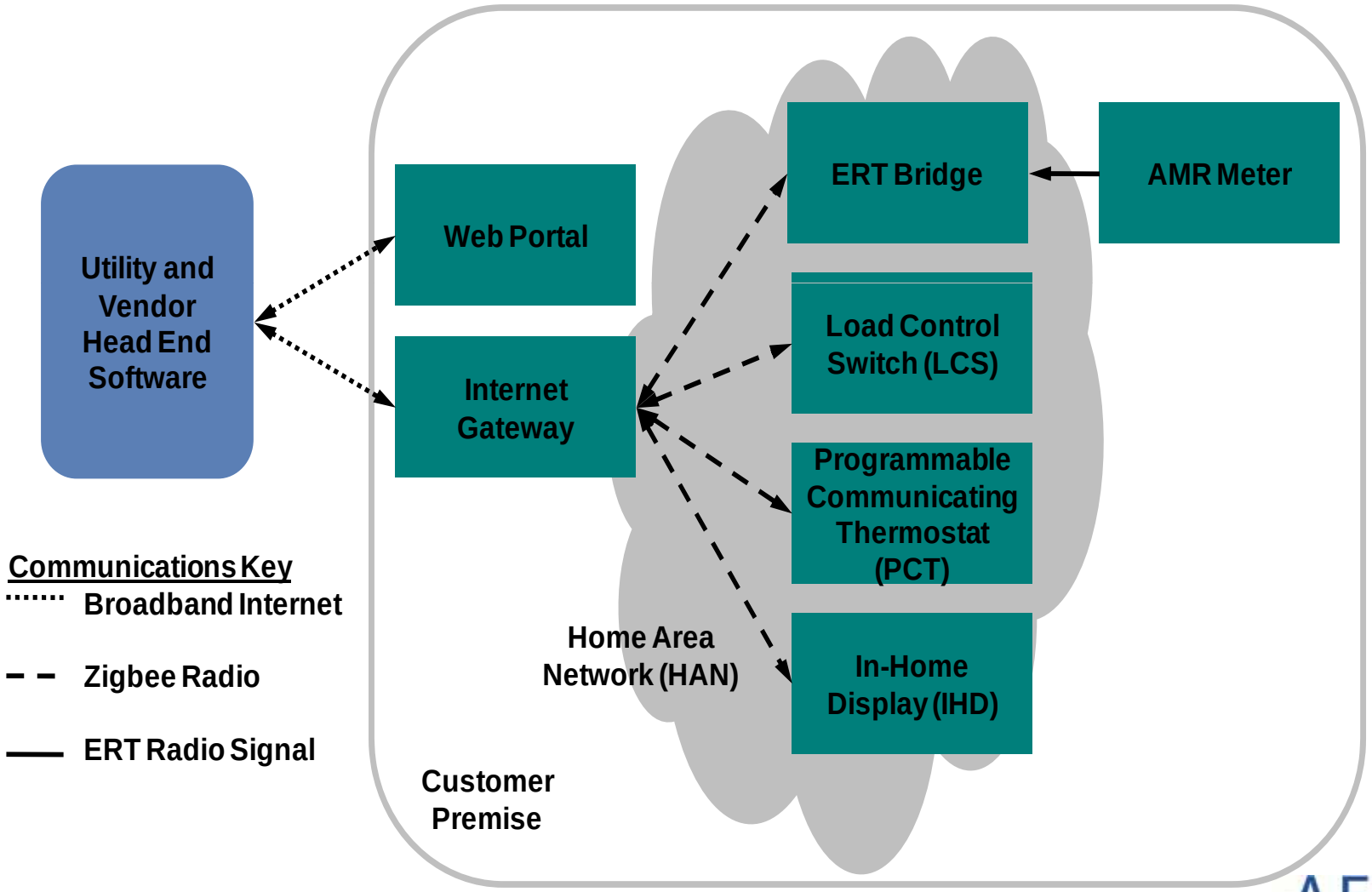
Program#1: AMR+HAN Pilot



Comparison to AMI w/ HAN

Description	AMI w/HAN	Upgraded AMR w/HAN
Interval Data	X	X
Customer Information	X	X
Direct Load Control	X	X
Temperature Setbacks	X	X
Remote Upgrades	X	X
Revenue Protection	X	X*
Meter Diagnostics	X	X*
Remote Disconnect	X	
Automated Outage Reporting	X	X**

*Interval data can be used to determine some level of revenue protection and meter diagnostics. **Future enhancement proposed.

Source: Based on assessments by utility's engineering team, third-party vendor, and consultants.

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Configurations to be Tested

Technology + Pricing Options

#	Treatment Group	AC Load Control?	Target Enrollment
1	TOU Rate plus Critical Peak Pricing (CPP)		700
2		X	700
3	Critical Peak Rebate	X	700
4	Technology-Only		700
5	Control Group		250
	Total		**3,050**

Note: All groups except the control group will receive an Internet gateway and an in-home energy display.

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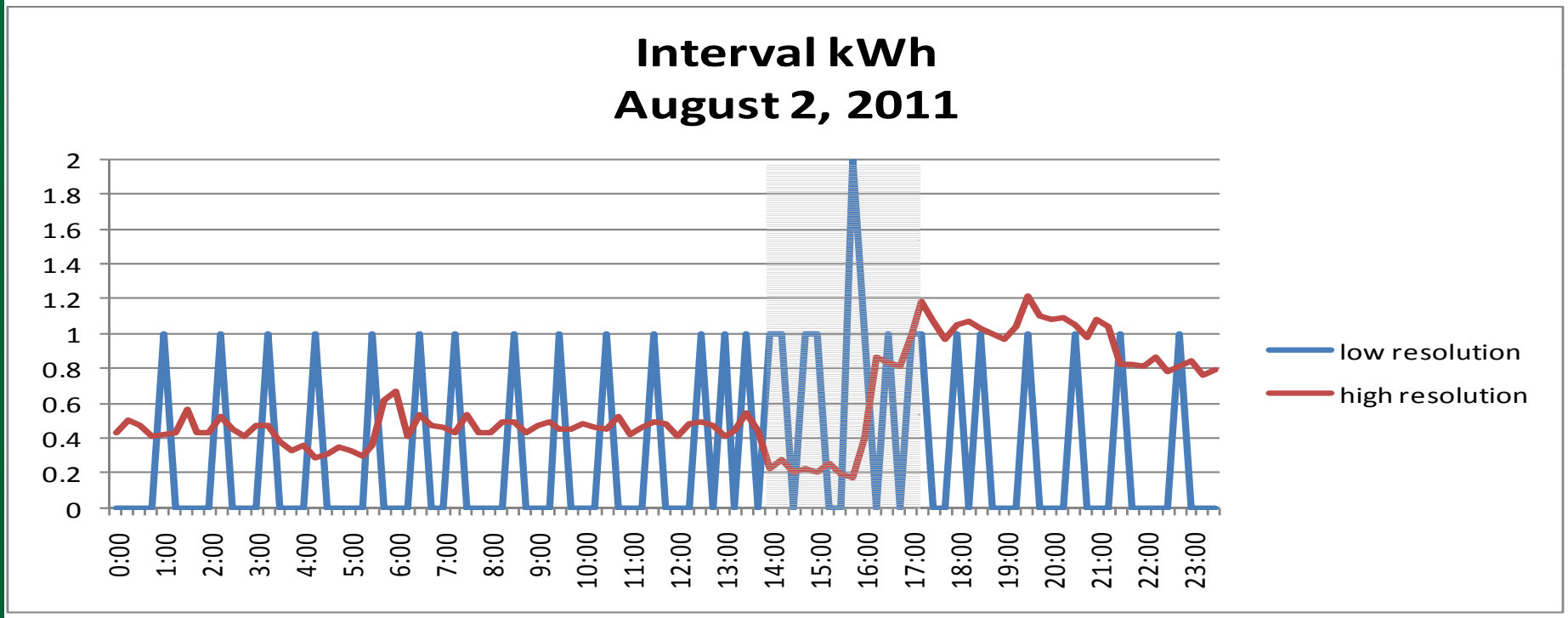
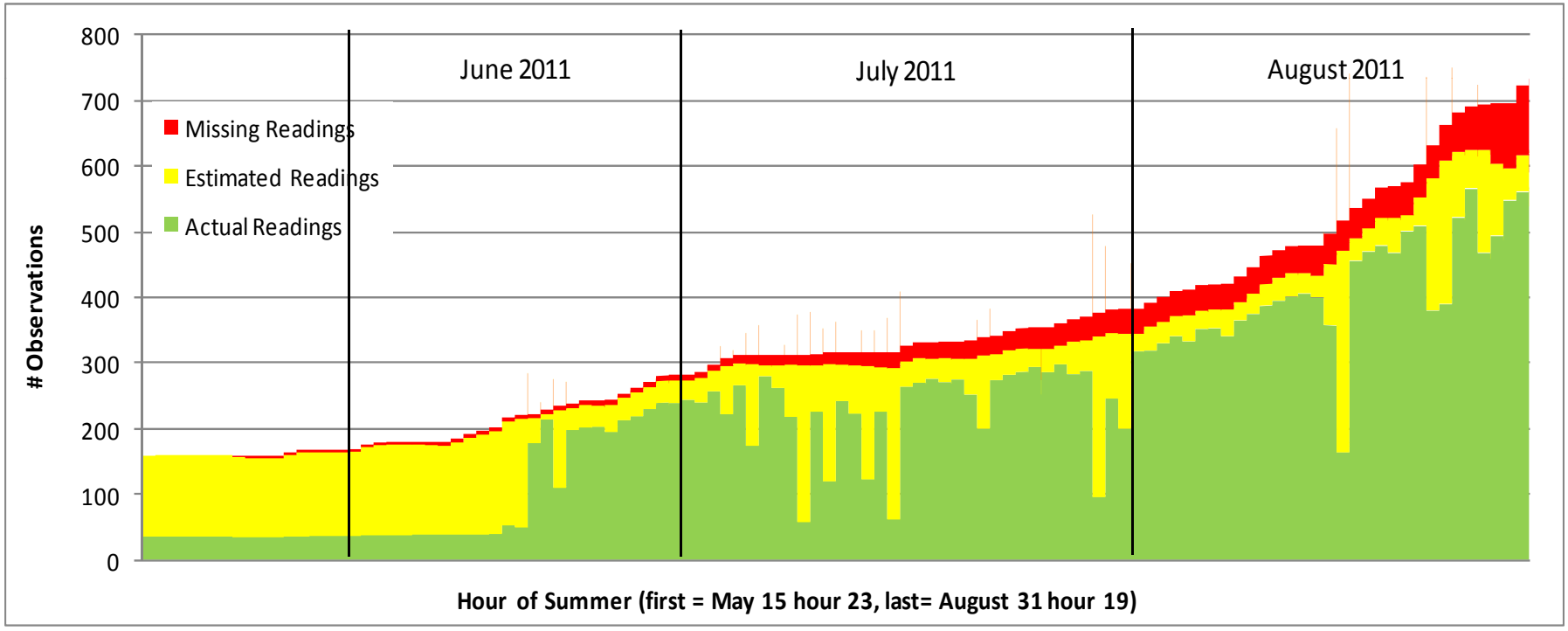
Meter Data: Resolution

- Two resolutions: Wh and dWh
- Makes data *choppy*



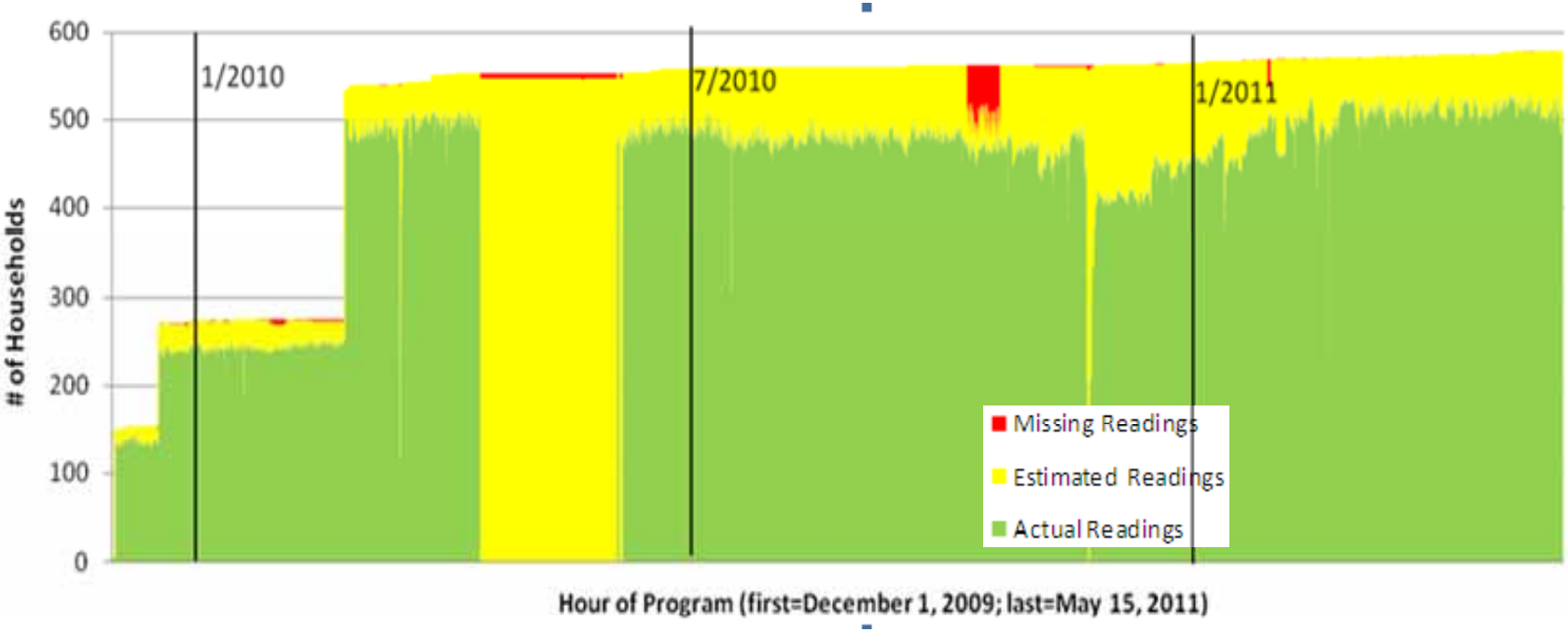
Meter Data: Completeness

- ERT “Chirps” snapped to 15 minute boundaries
- Gaps filled



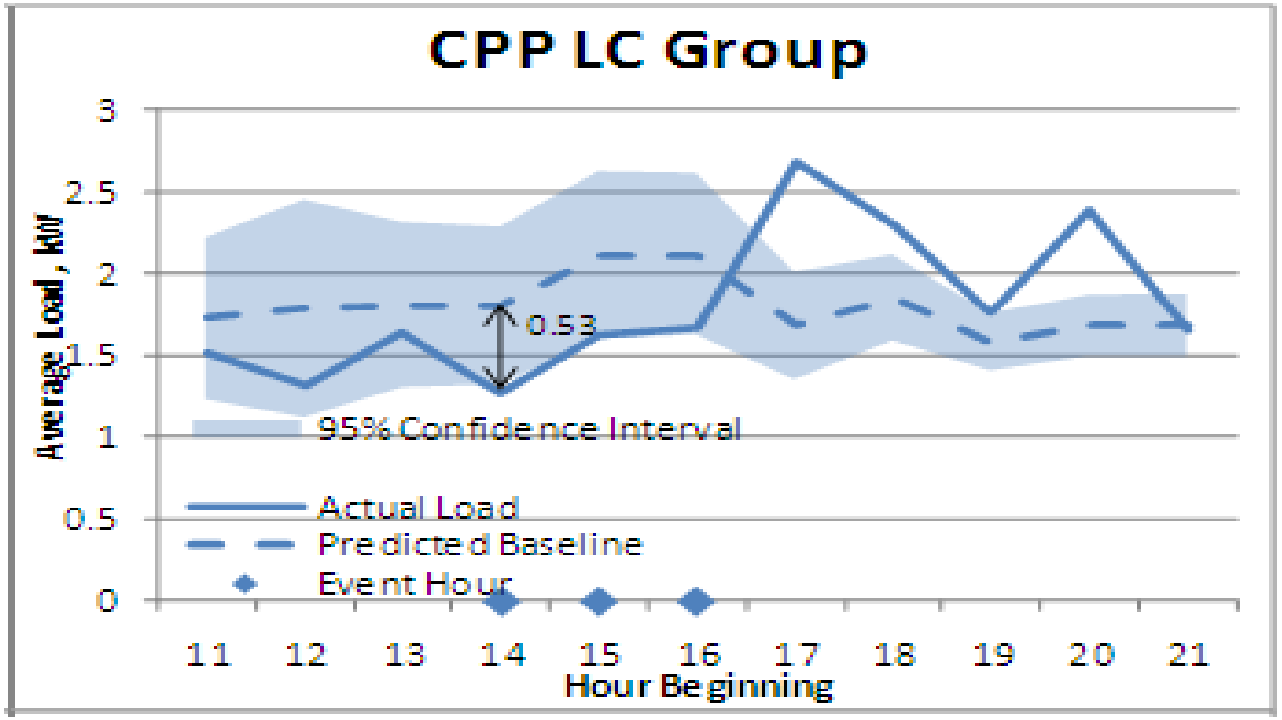
Meter Data: AMI

- Contrast with more “traditional” AMI
- Longer time period



Initial Conclusions

- Meter data can be used successfully for impact evaluation…



- Now, what about billing?

Program #2: AMI + Tech. Options

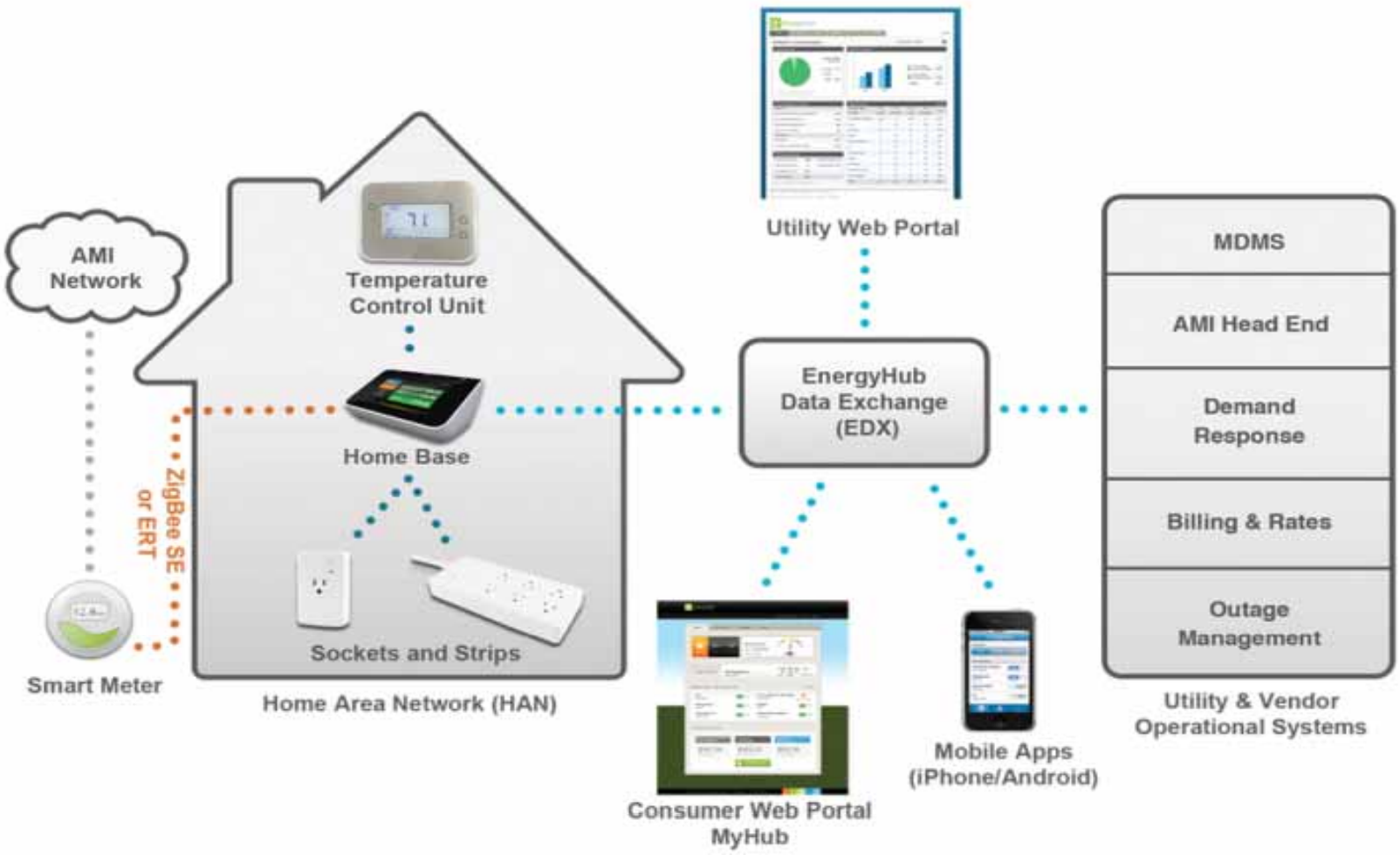
- Technology + Pricing Options

#	Group Description	Equipment	Target Enroll-ment
1	CPP with Customer Energy Control Device	Vendor A PCT:AMI vs. Vendor B PCT: BBand	300
2	In-Home Energy Information Display	Vendor A IHD: AMI vs. Vendor B IHD: AMI	300
3	Direct Load Control	Vendor A PCT:AMI vs. Vendor B PCT: BBand	300
4	Smart Phone or PDA App	Home gateway: BBand	300
	Total		**1,200**

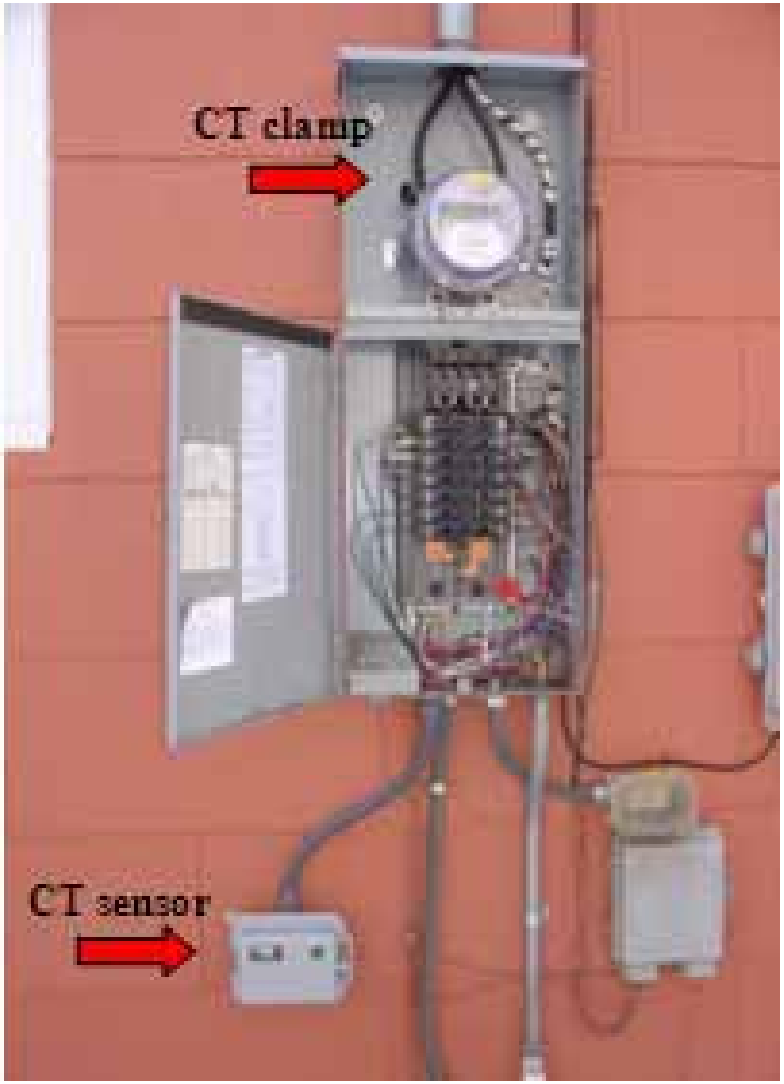
Initial Conclusions…

- Train is still at the station!
  - System software delays (AMI vendor)
  - Now starting to move slowly…

Program#3: Metering “Overlay”



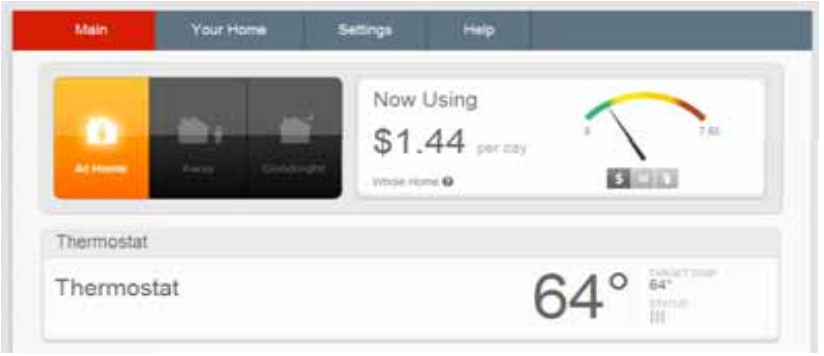
Key Capability

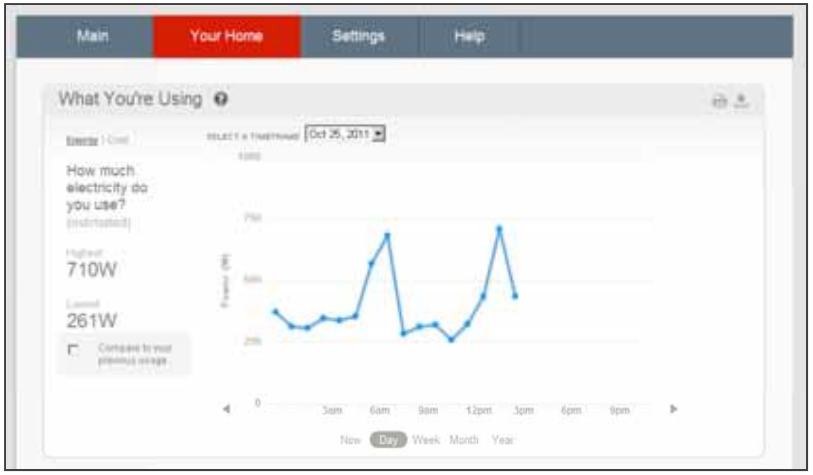


- Current Transformers (CTs)
  - Requires professional install
  - Note: solution also leverages smart meter

In-Home Information

- Energy consumption display(s
  - Local and remote
- Higher resolution possible in local display
  - More dynamic
  - Enables another level of feedback





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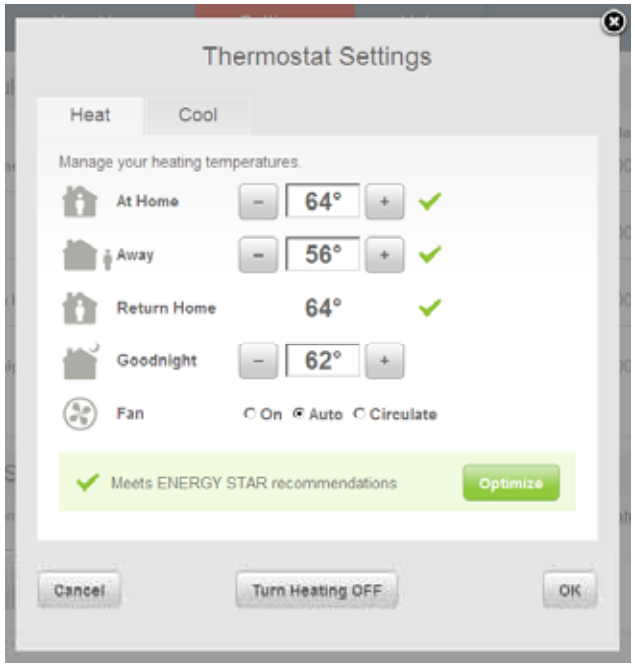
In-Home Load Control

- Central A/C load
- Selected plug-load
  - "smart dishwasher"



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Takeaways from Program#3

- Major consumer advantage--near real-time visibility and feedback, but…
- Installer must be an electrician AND have working knowledge of HVAC AND IT(!) AND available tele-support
- Lengthy install time effects economics
  - And reliance on customer technology & configuration (e.g., WiFi) presents lots of opportunity for walk-aways
- These factors make system expensive
  - Utility advertizes system as “$1200 value”
  - Cost must come down to scale solution

Lessons Learned (So Far)

- Residential smart grid is *creeping* forward…
- Pilots and trials present extremely important learning grounds
  - Technology is making progress, but maturity and availability of key interoperability points can impact entire project
  - Interoperation with *production* systems not yet being significantly tested
  - Nevertheless, this experimentation is critical to moving interoperability and the industry forward
- Business case is TBD
  - Pilot vs. production scale economics
  - Uptake on opt-in capabilities is critical factor

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Save the Date

May 15-17, 2012	AESP's Spring Conference Baltimore, MD
Oct. 15-17, 2012	AESP's Fall Conference Long Beach, CA
Jan. 28-31, 2013	AESP's 23rd National Conference Orlando, FL

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