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Smart Grid & Dynamic Pricing at Northeast Utilities

Prepared for ISO New England's Consumer Liaison Group Meeting

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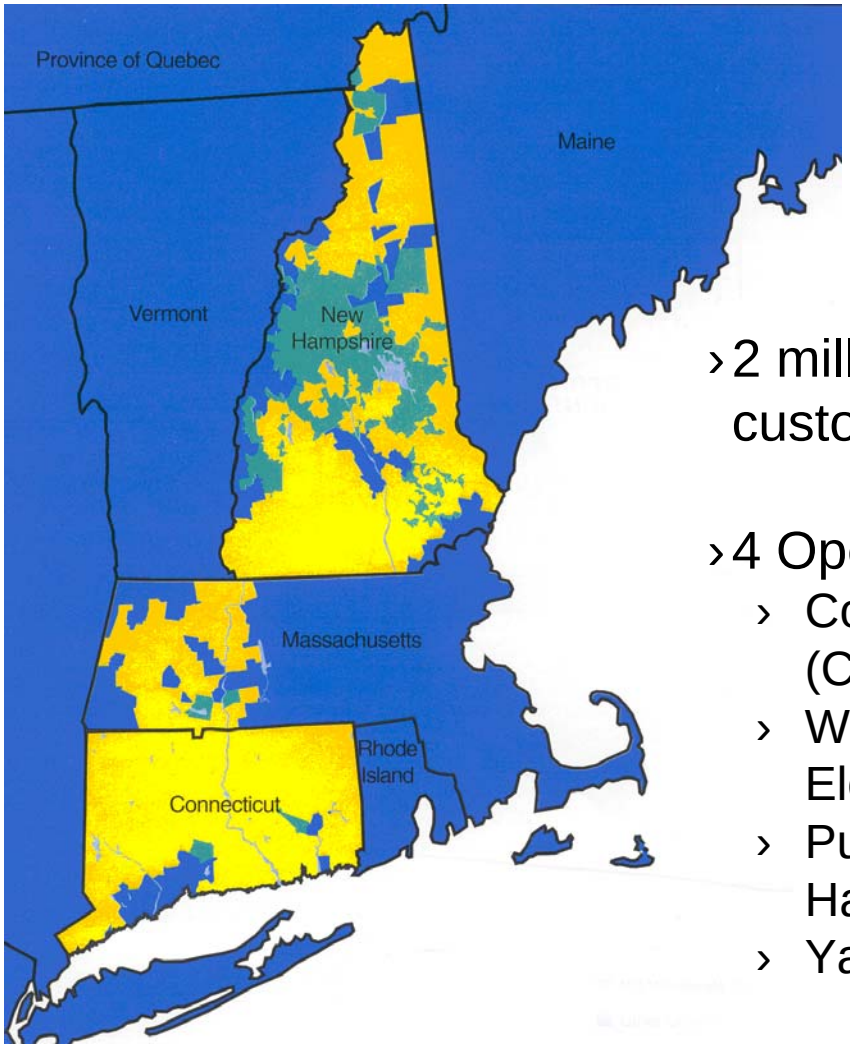
Agenda

- Introduction to NU
- Smart Grid at NU
- CL&P Plan-It Wise Pilot
- CL&P AMI & Dynamic Pricing Recommendations
- Next steps at NU

Northeast Utilities (NU)– Largest utility in New England



- 2 million electric & gas customers in New England
- 4 Operating Companies
  - Connecticut Light & Power (CL&P)
  - Western Massachusetts Electric Company (WMECO)
  - Public Service of New Hampshire (PSNH)
  - Yankee Gas (YG)

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What are NU's Smart Grid goals?

Smart Grid Components

Transmission & Distribution Automation → **"Smart Meters" (AMI)** → **Customer Technologies**

Smart Grid Goals	Smart Grid Characteristics
Provide information and control tools to manage energy usage and costs	1. Informed participation of customers
	2. Enablement of new products and services (i.e., in-home services)
	3. Integration of distributed generation and storage resources
Provide pricing options that may help customers lower their overall bill.	4. Management of energy demand & usage through dynamic pricing
Modernize the grid infrastructure to provide safer, more cost effective, and more reliable service	5. Improved metering operations
	6. Improved outage management
	7. Increased distribution system operational efficiencies
	8. Increased focus on power quality and voltage control
	9. Optimized asset management

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What are Smart Meters? What is an Advanced Metering Infrastructure?

1. Smart meters have the same metrology that has existed for 20 years.
2. Smart meters can be read remotely over a radio network, instead of reading meters by driving by in a van like today.
3. Smart meters capture hourly (or more frequent) energy usage, instead of providing only a monthly odometer-like reading like today.
4. Smart meters can be read on-demand, instead of having to send someone out to read the meter.
5. Smart meters provide a “last gasp” notification to the utility, so the utility knows that specific customer has lost power.
6. Smart meters can flow energy two-ways (net metering), which enables distributed generation.
7. Smart meters can enable remote service activation.

AMI is the combination of the smart meters, communications and information technologies that provide advanced metering functionalities.

What are Customer Technologies?

Customer Technologies

Basic

- Simple high-low indicator (energy orbs)

Enhanced

- More comprehensive in-home displays (IHDs) (usage, cost, time, etc.)
- Energy management dashboards
- Smart plugs
- Programmable communicating thermostats (PCTs)

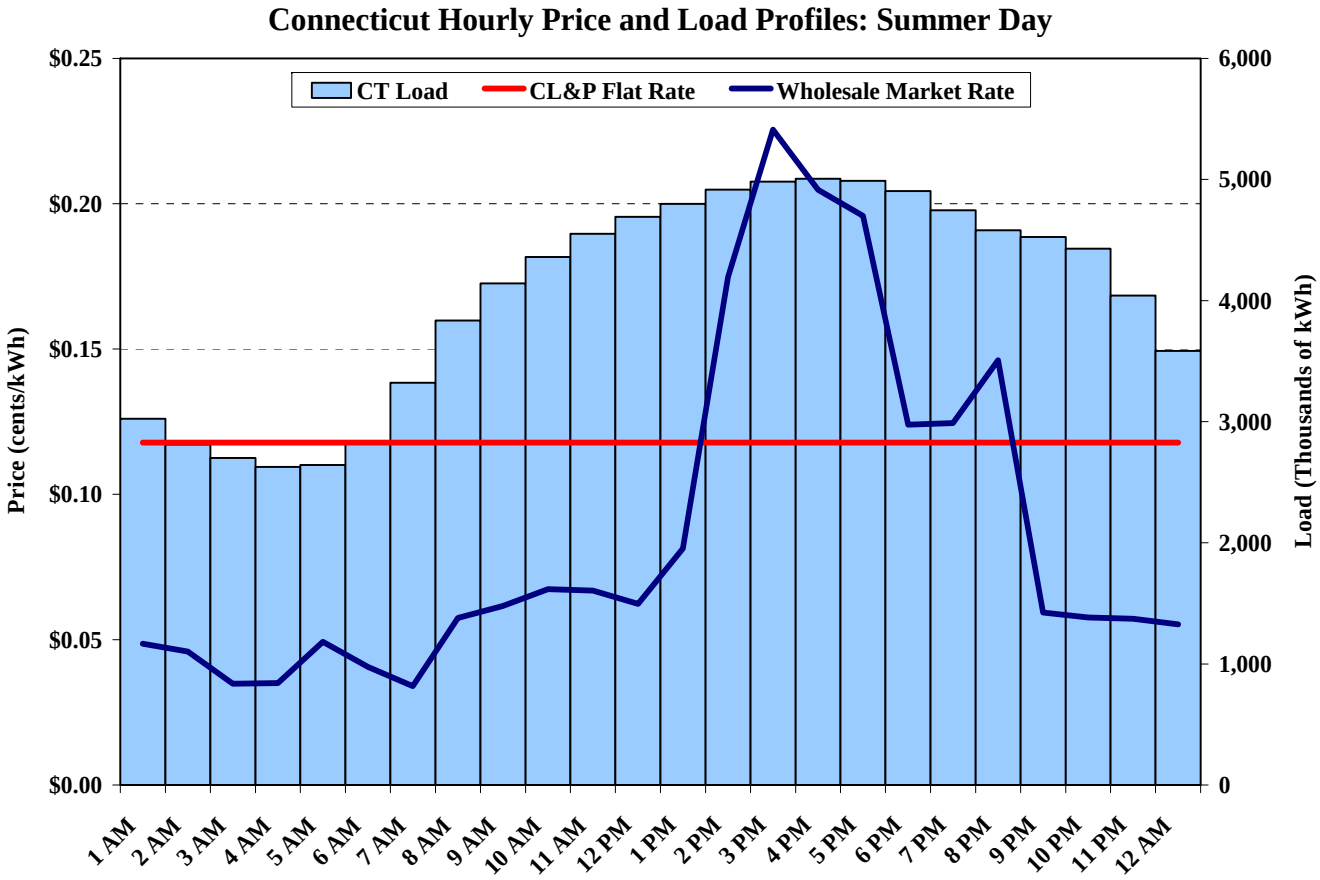
Advanced

- Load controllers
- Fully automated intelligent home energy management system
- Smart appliances
- Smart controllers for electric vehicles
- Devices to integrate distributed generation and storage

Benefits from deploying AMI in conjunction with dynamic pricing.

- Peak load reduction through dynamic pricing
- Energy conservation
- Carbon emissions reduction
- Operational benefits
- Other (i.e., integration of DG and EVs)

Pricing signals can help manage peak demand and reduce overall system costs.



The top 100 hours "average" cost is about 588% of the total average annual hourly cost.

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Background

CT 2007 PA-07-242 AN ACT CONCERNING ELECTRICITY AND ENERGY EFFICIENCY requires AMI to:

1. Support proactive customer pricing signals;
2. Enable implementation of voluntary critical peak pricing or real-time pricing tariffs for all customer classes;
3. Track hourly consumption and;
4. Support net metering

- Pilot Objective: To test customer response to various Dynamic Pricing rates and the impact of "enabling" in-home technologies.
- Dynamic Pricing Design: 26 test cells to test 3 dynamic pricing rate structures, each with 2 pricing differentials for each customer class.
- Customer Participation: Target 3,000 Total; ~1,500 business customers, statewide; ~1500 Residential customers in Hartford and Stamford; demographically diverse.
- Pilot Metering: Sensus 2-way Radio AMI for Residential Customers; ITRON's traditional (non-AMI) 1-way cellular-read interval meters for C&I customers.

Plan-it Wise

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Dynamic pricing options

We tested 3 time-based rates effective from June 1 – August 31, 2009.

RATE	DAYS EFFECTIVE	TIME FRAME	PRICE DIFFERENTIAL ($/KWH)
Time of Use (“TOU”)	Every non-holiday week day	Noon – 8PM	Peak = +$0.142 Off Peak = -$0.058
Peak Time Rebate (“PTR”)	Top 10 Summer days	2 – 6PM	Peak = $1.614
Critical Peak Pricing (“CPP”, aka Peak Time Pricing or “PTP”)	Top 10 Summer days	2 – 6PM	Peak = +$1.614 Off Peak =-$0.036

Smart Thermostats

CL & P Energy Orb Helping People Save Money On Electricity Bill

Keith Henderson is participating in a Connecticut Light & Power program that alerts him to peak electricity usage and helps conserve energy. Henderson holds an orb that glows different colors and tells him the optimum time to use electricity. He keeps the lights off and the window shades closed during the day to conserve energy. (MICHAEL MCANDREWS / HARTFORD COURANT / August 4, 2009)

Blue Line Power Cost Monitor

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Peak load reduction results

CL&P Rate Pilot Results

Pricing->	Peak Time Pricing		Peak Time Rebate		8-HR Time of Use	*4-HR Time of Use
Customer	Pricing	w/ Controlling Technology	Pricing	w/ Controlling Technology	Pricing	Pricing
Residential	19.6%	28.5%	13.2%	21.8%	4.1%	6.3%
Business	3.6%	9.4%	0.0%	5.3%	0.0%	0.8%

Customer satisfaction results

OVERALL CUSTOMER SATISFACTION

Residential	5.1/6
C&I	4.1/6

PEAK RATE SATISFACTION RANKINGS:

RATE	Peak Time Pricing	Peak Time Rebate	Time of Use
Residential	1st	2nd	3rd
C&I	1st	3rd	2nd

TECHNOLOGY SATISFACTION RANKINGS:

TECHNOLOGY	A/C Control Switch	Energy Orb	No Tech	Smart Thermo Stat	In Home Energy Display
Residential	1st	2nd	3rd	4th	5th
C&I	1st	4th	3rd	2nd	N/A

92% of Residential and 74% of Business customers would participate again.

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Key plan elements

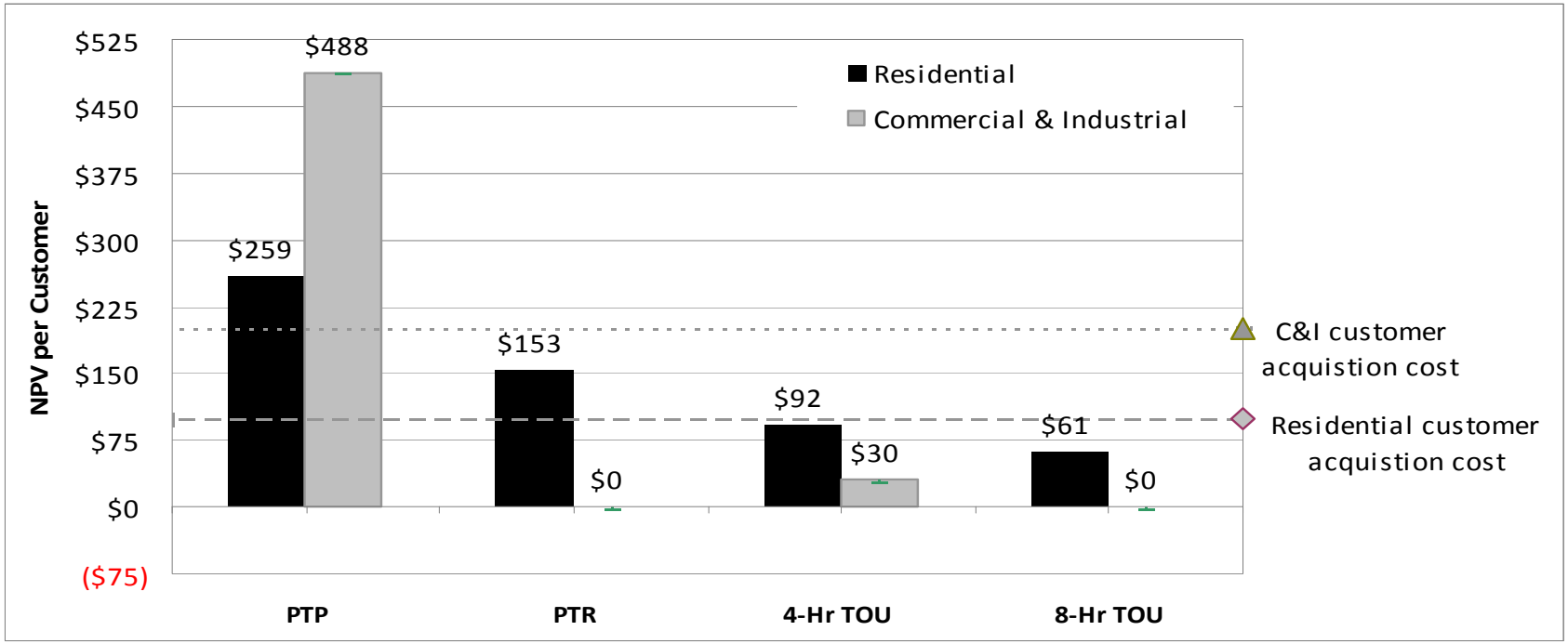
1. Provides customer choice, including high price differential dynamic rate options

2. Assumes energy conservation impact, by providing printed a snapshot of hourly energy information and analytics regularly to all customers

3. Uses a full customer deployment solution because it is most cost effective.

4. Times the deployment to coincide with development of AMI standards.

Dynamic pricing is cost-effective



Controlling technology for CL&P C&I customers is very cost effective, but for our Residential customers it is not cost effective.

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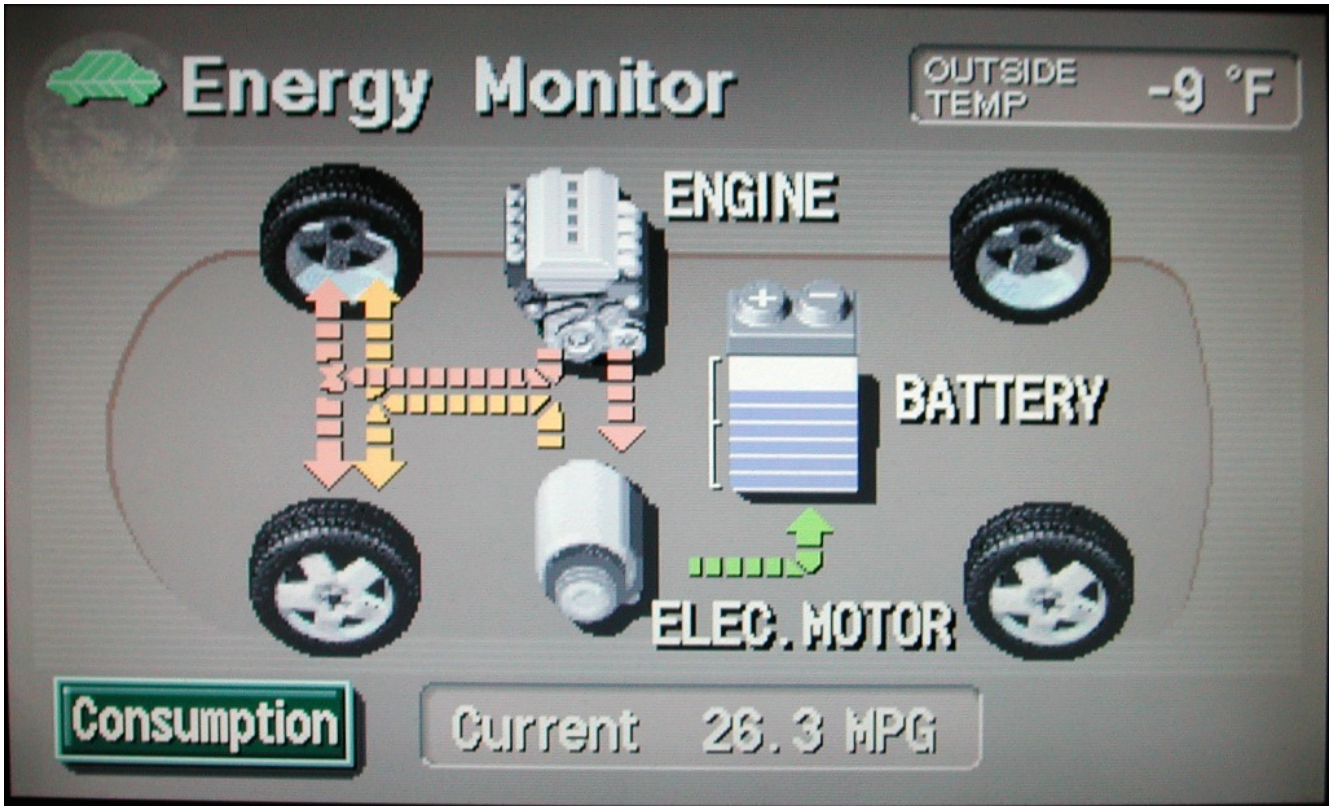
All customers will have smart meters and dynamic pricing options.

- Only customers who voluntarily sign up for a dynamic pricing rate will participate.
- PTP rate offered to all customers to sign up on a voluntary basis.
- PTR offered solely to all low income customers to encourage participation, while not exposing them to the risk of higher bills that may result as an impact of PTP.
- No further extension of the 8 hour TOU rate for residential and C&I customers with peak energy loads less than 100kW.
- Offering a four-hour TOU rate to all customers in conjunction with the PTR or PTP rates.
- Use an on and off-peak period price differential similar to the differential tested in the Pilot, to encourage greater responsiveness.

Energy conservation is key.



When offered comparison information, OPOWER (an energy efficiency software company), indicates that on average customers experience a 2% reduction in consumption when compared to a control group with reductions ranging between 1.5% and 4.5%.

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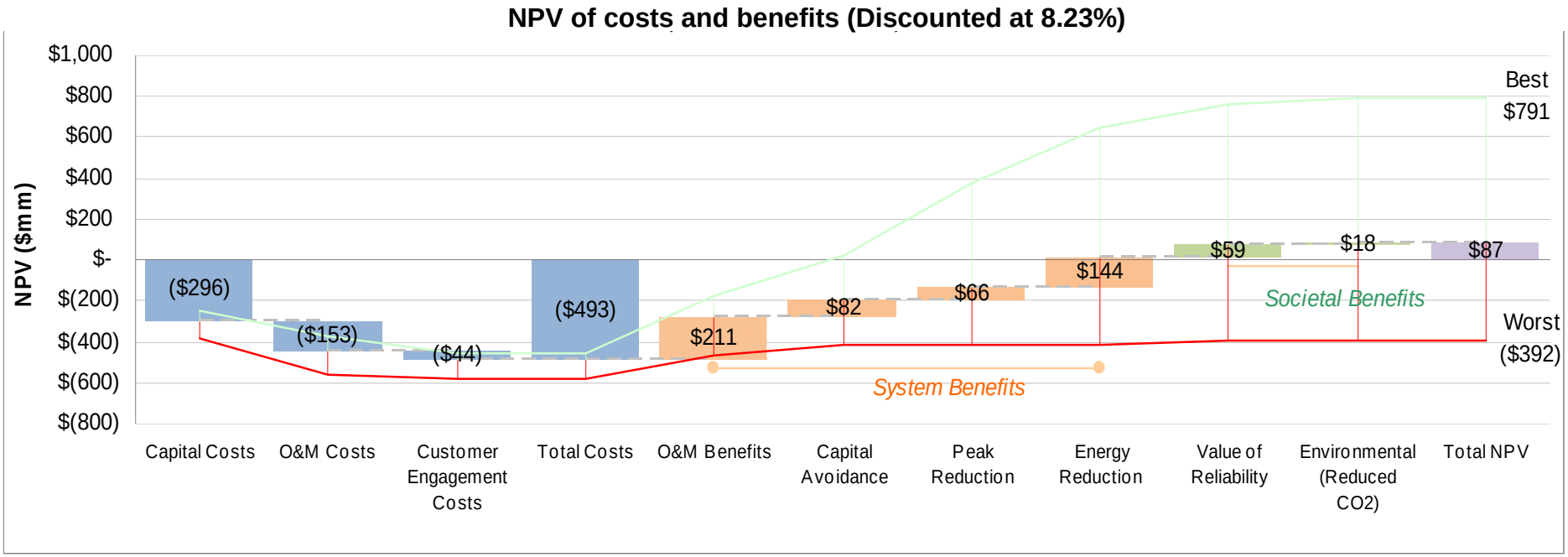
Base case scenario is cost effective, but dependent on external variables.



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AMI deployment starts in 2012 if approved by DPUC.

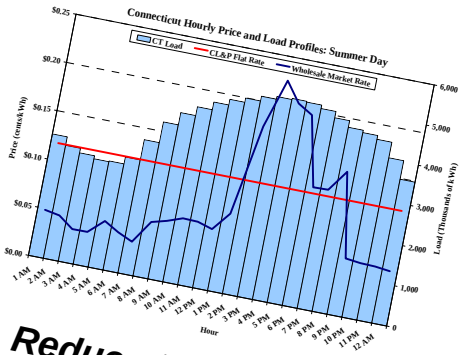
	PHASE 1: PLANNING MDM, Plan Approval, Pilot, AMI Standards & Contract Negotiation						PHASE 2: DEPLOYMENT AMI & Dynamic Pricing									PHASE 3: Operational Efficiencies		
	2009		2010		2011		2012		2013		2014		2015		2016		2017	
PROJECT ACTIVITY	H1	H2	H1	H2	H1	H2	H1	H2	H1	H2	H1	H2	H1	H2	H1	H2	H1	H2
MDM IT Platform Implementation	■	■	■	■	■	■												
NIST develops key AMI standards	■	■	■	■	■													
AMI RFP, Vendor Selection & Contract Negotiation						■	■	■										
Request DPUC approval of known vendor costs							■											
DPUC approval								■										
MDM/AMI IT Integration with Hourly Storage								■	■	■								
PHYSICAL AMI DEPLOYMENT								■	■	■	■	■	■	■	■			
Market and Build Dynamic Pricing capability																		
Integrate Theft ID, Remote Activation & Outage ID Capability										■	■	■	■	■	■	■	■	■

Prior to commencing full deployment, the Company proposes submitting the following filings to the Department:

›On or before October 31, 2011 - Informational update on key AMI standards, AMI technology, AMI deployments and Smart Controlling Technologies in the industry.

›On or before July 31, 2012 - Request for Department approval of AMI & dynamic pricing cost recovery based on AMI vendor responses to the Company's RFP

Summary of other benefits



Reduced system costs

- ~125 MW of peak load/yr (not run a small generation plant)
- Reduce ~190,000 MWh/yr (equal to power required for 20,000 homes)
- 2% minute storm outage reduction

Customer Satisfaction

- Hourly energy usage information
- Increased choice and control
- Dynamic pricing options
- Electric vehicle smart charging
- Easier integration of distributed generation
- Capability to automate energy management through home area networks

Support a greener future.

- ~100,000 tons of CO2/year from reduced energy conservation and less usage of “dirtier” plants
  - Equivalent to ~13,300 cars off the road per year

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What are we doing at WMECO?

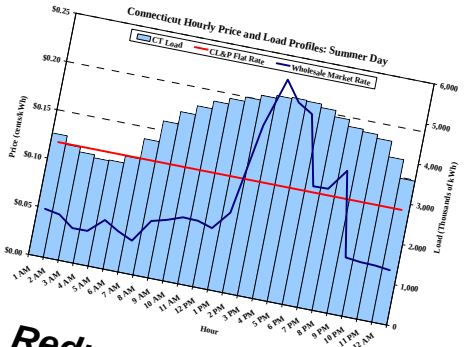
- WMECO filed its revised smart grid pilot plan on October 16.
- Current scope consists of testing multiple rate designs for 1,750 residential customers in the Springfield region from April through September 2011.
- Plan includes deployment of advanced meters and associated communications infrastructure to all pilot participants.
  - Some participants will receive an in home energy display and/or some type of automated load control technology.
  - All customers will have access to hourly usage through a secure website.

Final thoughts

First goal is to provide our customers with **information and control tools** to manage energy usage and costs.

Second goal is to provide our customers with **choices on pricing options** that may help them lower their overall bill.

Third goal is to **modernize the grid infrastructure** to provide safer, more cost effective, and more reliable service to customers.



Reduced system costs

Customer Satisfaction

Support a greener future.

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Questions?

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