Smart Grid Technology: Measuring Residential Energy Use

Cape Cod Technology Council Breakfast
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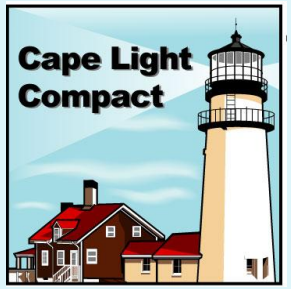
Briana C. Kane, Senior Residential Program Coordinator
Kevin Galligan, Energy Efficiency Program Manager
Cape Light Compact
and
Doug Horton, NSTAR Electric

About Cape Light Compact

- Municipal Aggregator, Administer $24 million Energy Efficiency 2011 Program Budget
- Serve 21 Towns on Cape Cod and Martha's Vineyard through local governing board
- Approx. 200,000 electric accounts
- 87% of accounts are residential
- Industry mix is tourism and retirement services, small biz
- Seasonal and second homes



What is the Smart Grid?

According to EPRI (Electric Power Research Institute)

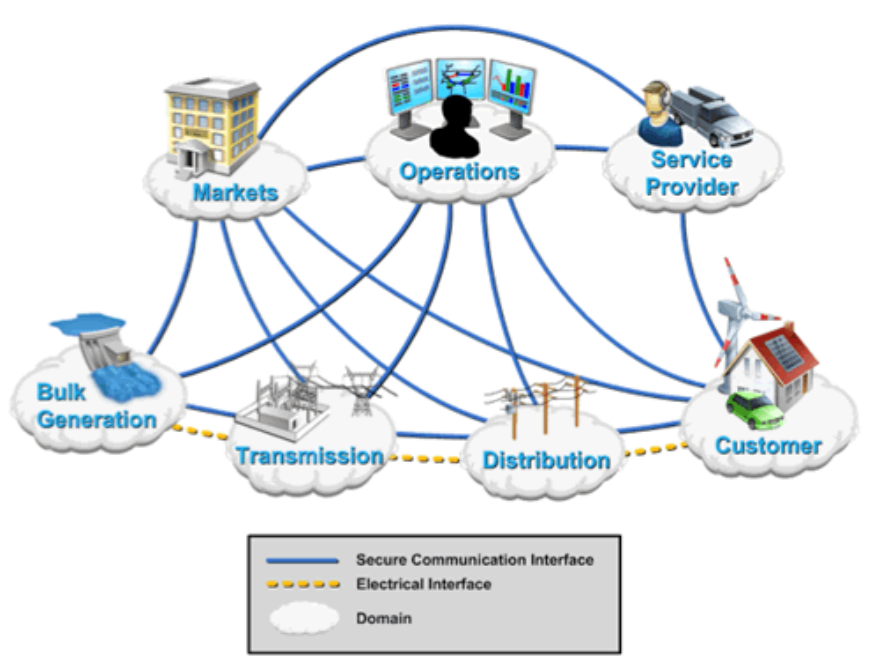
"A Smart Grid is one that incorporates information and communications technology into every aspect of electricity generation, delivery and consumption in order to minimize environmental impact, enhance markets, improve reliability and service, and reduce costs and improve efficiency."

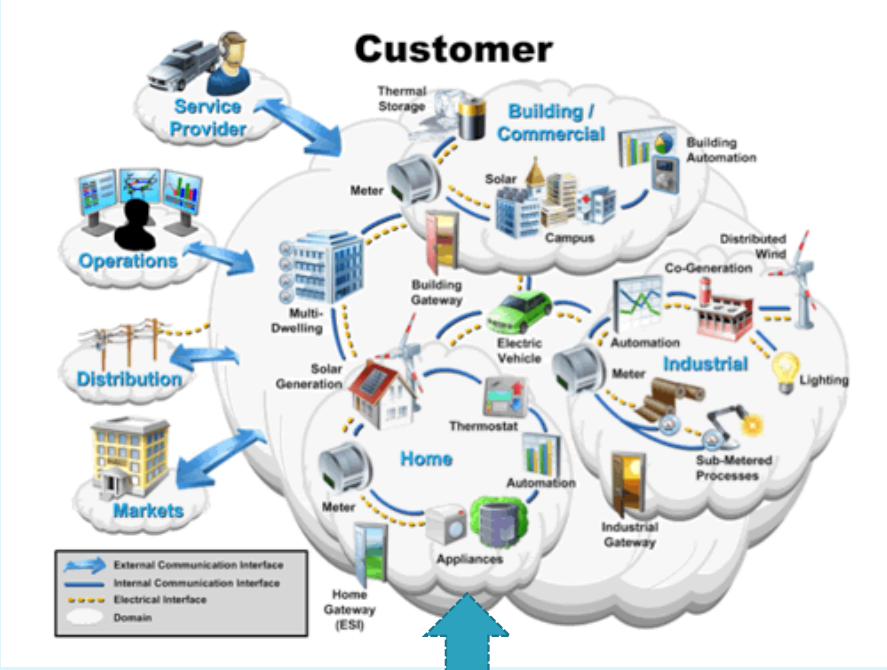
http://smartgrid.epri.com

EPRI | ELECTRIC POWER RESEARCH INSTITUTE

What a Smart Grid looks like

High-level conceptual model – multiple domains





Home Energy activities are just one segment of Customer domain

Source: NIST Smart Grid Conceptual Model, see: www.nist.gov/smartgrid

Smart Meters are conduits that allow increased communication between utility and consumers

Old (or current)

New (or future?)

What we know about Home Energy Management

- R&D is advancing rapidly
  - Technology: price and availability
  - Design protocols are taking shape
- Multiple vendors
- Standards are coming *(NAESB & NIST*)*
  - Interoperability
  - Evaluation, measurement & verification
- Public policy and regulatory support
  - Energy information can empower consumers to make better/smarter choices to use and save energy

* North American Energy Standards Board & National Institute of Standards and Technology

Smart Home Energy Monitoring – Phase I

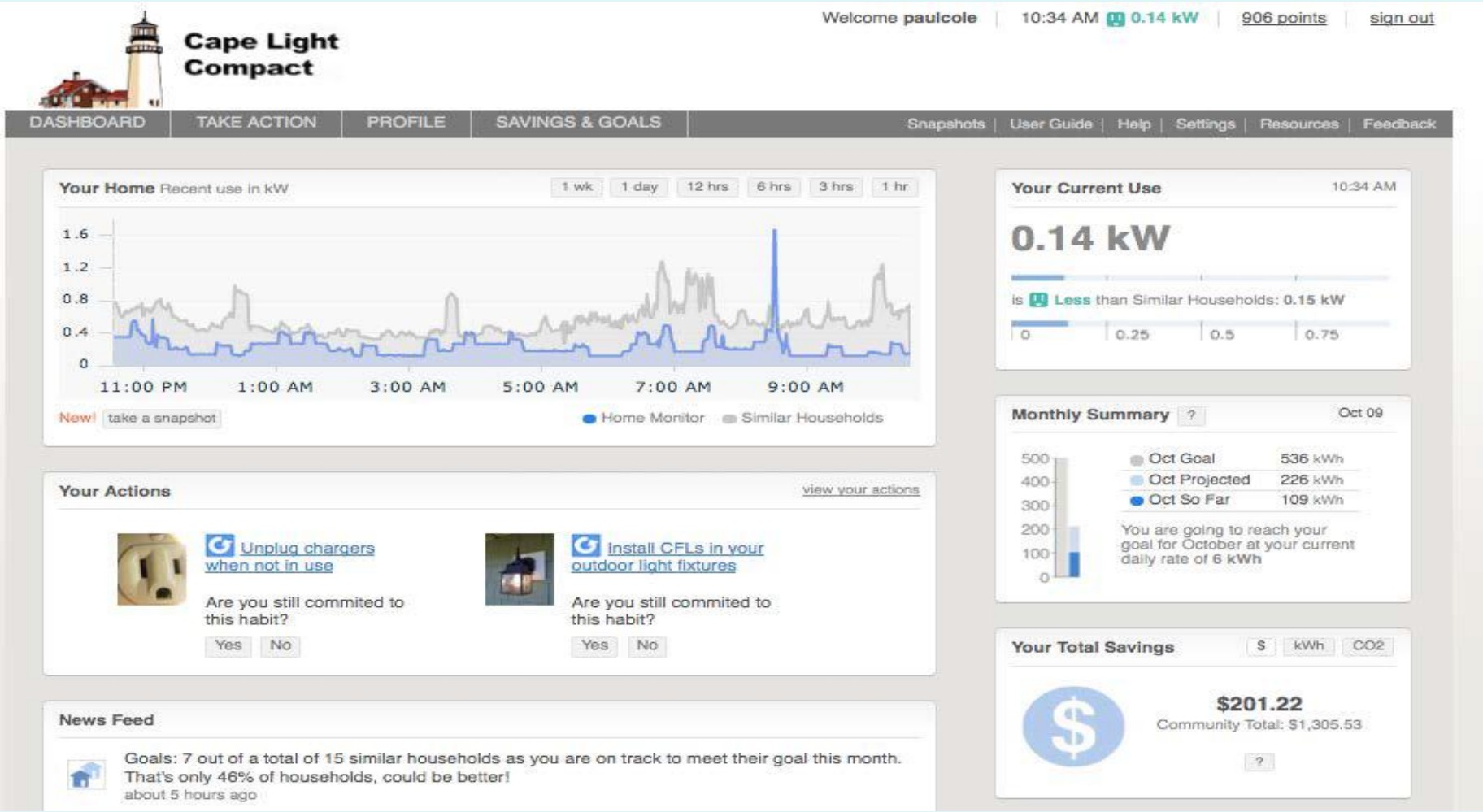
- February, 2009: recruitment via media
- May, 2009: 100 participants selected
  - 75 on Cape Cod and 25 on Martha's Vineyard
  - Minimum of 1-yr prior use and >600 kwh/mo
- July – Sept, 2009: systems installed
- July – current: active participation
- August, 2009: kick-off evaluation study
- March 31, 2010: study results
  - Reduced electricity consumption by 9.3%
  - Implied Average Annual Savings 997 kWh

SHEMP – Phase II

- Recruitment started in the Spring of 2011
- Installs took place over the summer and early fall
- Tendril Energize™
  - Home Area Network, Transport Gateway and Translate bridge
  - Near real-time energy use data
  - No need to access electric panel
  - Interactive web-based displays
  - Goal setting customer engagement

- Preliminary 3rd party evaluation results expected August 2012

What customers see



How customers interact

Browse Snapshots
Your Snapshots
Public Snapshots

Search Snapshots
Go

lewis.cape's snapshots
Snapshot 3
Mystery spikes
view all

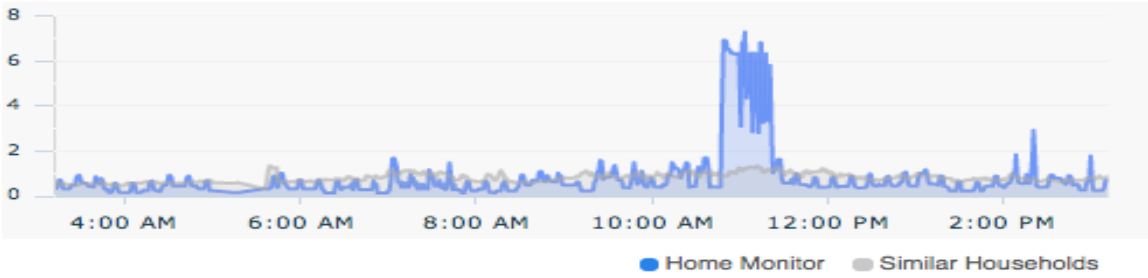
Snapshots by Type
Lighting
Heating & Cooling
Kitchen
Home Electronics
Misc Appliances

Popular Tags
oh that dehumidifier refrigerator cycle dryer dishwasher fridge dehumidifier water heater vacuum mice washing machine dishes laundry microwave boiler Keurig AC Space Heater baseboard heating

Snapshot 2

Created by **lewis.cape** on Sep 17, 2009
Type Misc Appliances Tags None

Sep 17, 2009 03:12AM - Sep 17, 2009 03:12PM



The wide spike represents a load of laundry in the washer and then the dryer. What is the significance of the intense blue versus the regular blue?

Post a comment or ask an expert 1 Comment

expert

emilyw posted 27 days ago
Hello! When your dryer is on, it does not use a constant amount of electricity, it cycles on and off, using more and then less electricity. This is what you are seeing with this spike. There is really no difference between the light and dark blue. In this view, this quick cycling on and off appears as a darker blue shaded region - it is actually the dark blue line that shows your electricity use going up and down over and over again (imagine drawing lines very close together with at thick marker - they would blend together). If you were to look at this zoomed in close, it should look more like a bunch of small peaks that are very close together, not a solid region.

NSTAR Smart Energy Pilot

Doug Horton
NSTAR Electric
Smart Grid Project Manager

This project will test customer reaction to rates and near real-time information

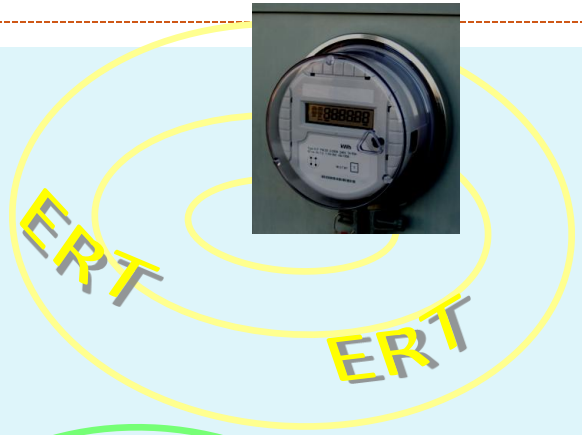
Group		Smart Thermostat / Direct Load Control	Central Air Conditioning	Target Number of Customers
1	Enhanced Information	No	50/50	**770**
2	Peak Time Rebate	☑	☑	**700**
3	TOU Rate plus Critical Peak Pricing (CPP)	☑	☑	**700**
4		No	50/50	**700**
	Total			**2,870**

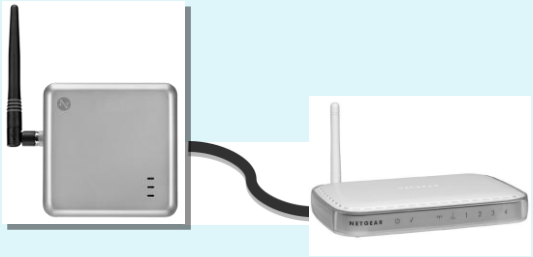
Tendril/NSTAR AMR-Based Dynamic Pricing

All participants

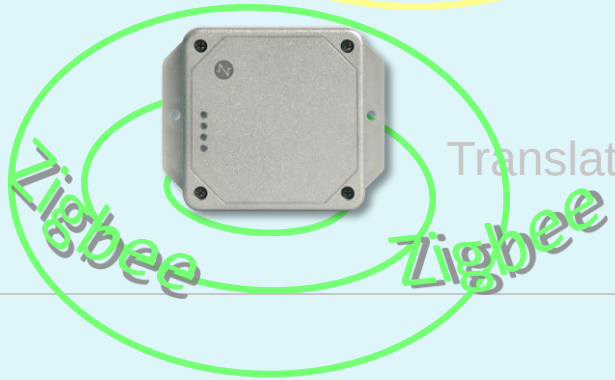
Portal

Display





Gateway



Translate

Half of the participants

Thermostat

Load Control Switch

Pricing Structures

- NSTAR will call no more than 12 Critical Peak Events during the course of the year, each lasting for up to 5 hours
- Peak Time Rebate customers will be eligible to earn a fixed rebate of $5 per event if the customer allows central air conditioning (A/C) load control
- TOU-CPP customers will experience steep price differentials, per the table below

Illustrative TOU and CPP Rate Periods and Prices

Period	Summer Period (June - September)	Winter Period (October - May)	Illustrative Standard Electricity Price ($/kWh)	Approximate Supply Price Ratio	Illustrative TOU-CPP Electricity Price ($/kWh)
Critical Peak	As called by NSTAR		$0.16	10.62 :1	$0.90
On-peak	Noon to 5pm non-holiday weekdays	4pm to 9pm non-holiday weekdays	$0.16	2.23 : 1	$0.25
Off-peak	All other times during the period		$0.16	0.60 : 1	$0.13

THANK YOU

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