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Smart Energy Solutions Program
Worcester, Massachusetts Pilot

Keith Miller

March 4, 2015

Quick Facts

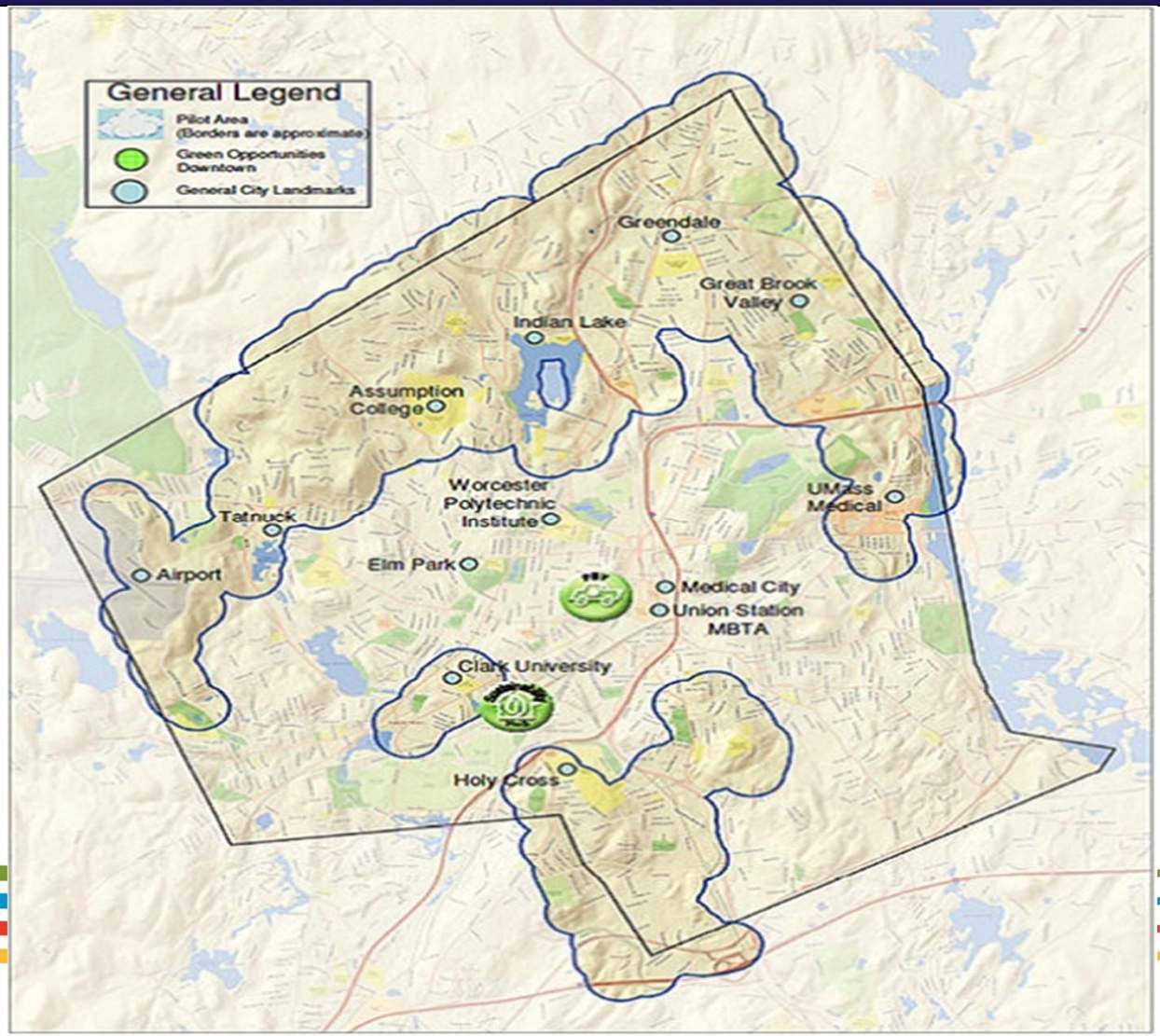
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- **Background**
  - **First proposed in 2008 as part of the Green Communities Act**
  - **$44M Pilot approved by MA DPU August 2, 2012**
  - **2-year opt-out pilot: ~15,000 Smart Meters**
  - **Dynamic pricing options**
  - **5 % Savings Goal**
  - **Home energy management devices/tools**
  - **Outreach and Education, Downtown Sustainability Hub**



Where in Worcester

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Why Worcester

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- Centrally located in Massachusetts - diverse population
- Mix of customers provides the opportunity to test the value proposition of: interactive rates, technology.
  - Customer actions will provide - implications and benefits of Smart Grid technology.
- Diverse distribution system with both underground and overhead networks
- Worcester's multiple institutions of higher learning are also committed to energy education and technology, renewables, energy efficiency, and will serve as a critical partner in the Program's success.

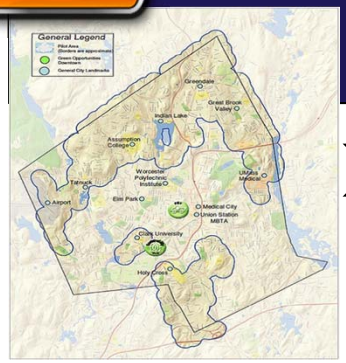


Our journey

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START



Pilot approved
August 2012



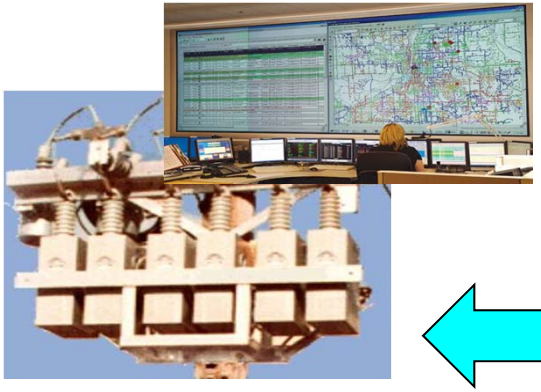
Hub Opens
October 2013



AMI Meter Installs
November 2013



Home Technology March 2014



First Grid Device
March 2014

Dynamic Pricing Plans
Demand Response
Advanced Analytics
Pilot Evaluation

Pilot Launch
January 2015

Program Status

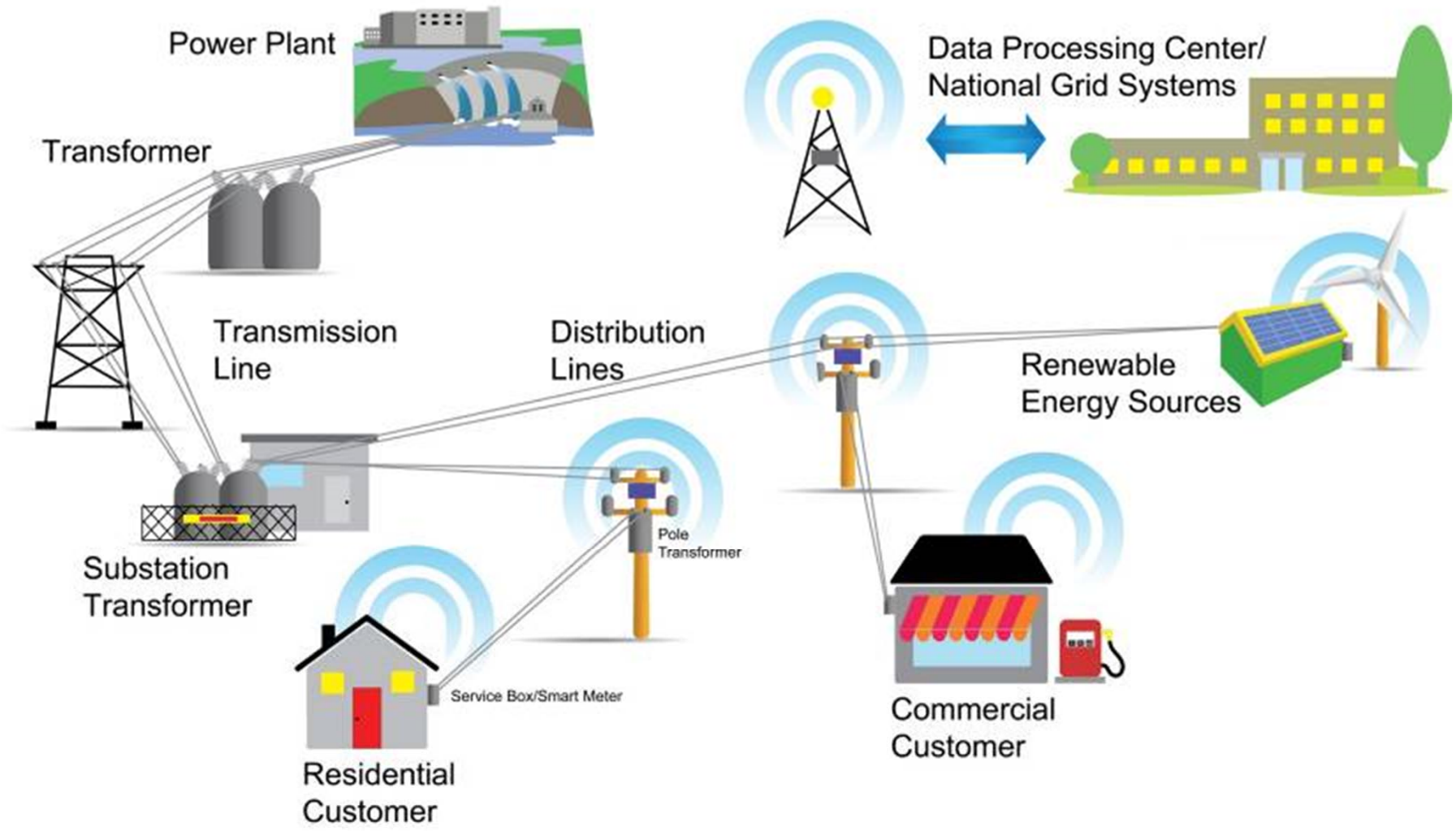
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- 14,800 AMI meters in-service for billing and data today
- Implemented and tested 12 advanced communications sites
- Sustainability Hub opened in Worcester in October 2013 for customer outreach and engagement
- Home energy management (HEM) technology enrollment and installation underway since March 2014
- Key grid experiments, such as distribution automation and Volt/Var management conducted in 2014
- Customer usage data and outage experience will be available in 2014
- Smart Rewards pricing live in January 2015

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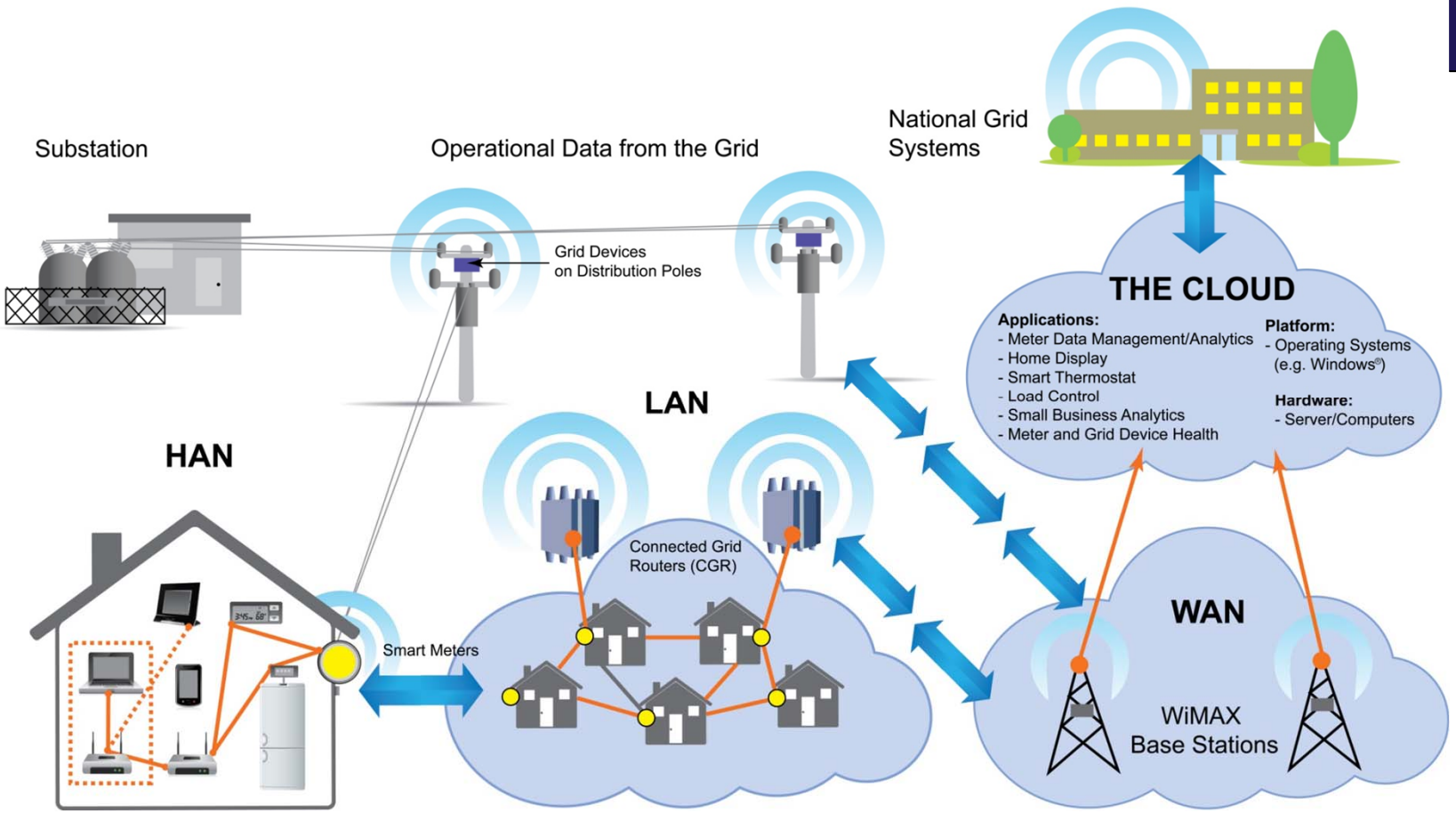
From concept….

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Smart Grid Component Overview

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Smart Grid Devices

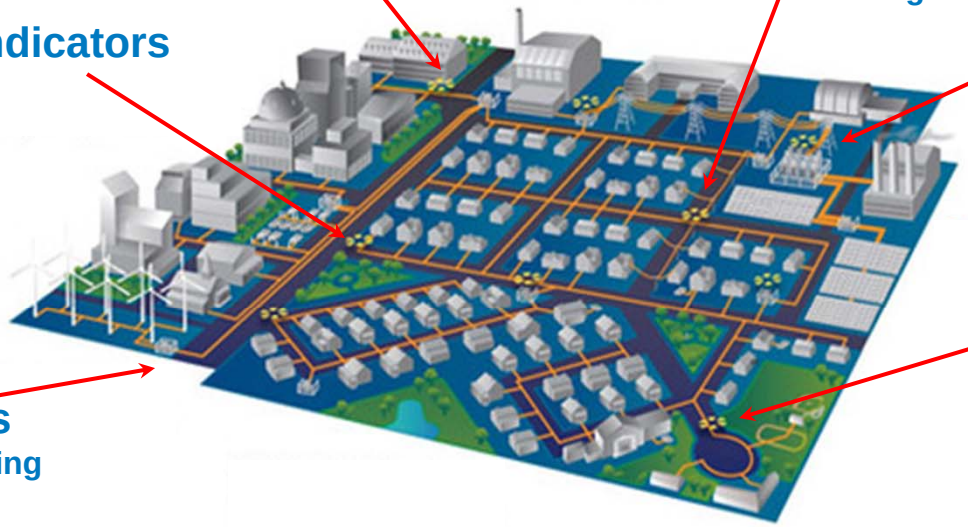
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47 Capacitor Banks
- Local Volt/Var Optimization
- Single Phase Switching

80 Reclosers
- Distribution Automation
- Intellirupter Experiment
- Single Phase Tripping

13 Faulted Circuit Indicators
- Fault Location

3 Substation Automation
- Volt/Var Optimization
- Distance to Fault Modeling



14 Transformer Monitors
- Detailed Transformer Data
- PHEV Monitoring
- PV Monitoring

20 Feeder Monitors
- Energy Storage Monitoring
- Detailed Feeder Data
- Wind Generation Monitoring

Advanced Analytics
- Data Mining/Analysis using information from all smart sensors

National Grid Smart Grid Pilot Proposal
Worcester, Massachusetts

Key Features and Devices

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- **Advanced Distribution Automation**
  - **Switches (like light switches) will open and close automatically**
  - **Power is restored quicker for customers.**
- **Advanced Capacitor Control**
- **Advanced Grid Monitoring**
  - **Real time information will allow National Grid to see delivery "bottlenecks" on our system**
  - **Monitoring devices will measure voltage and amps in real time**
  - **This will provide the grid version of the morning traffic report**

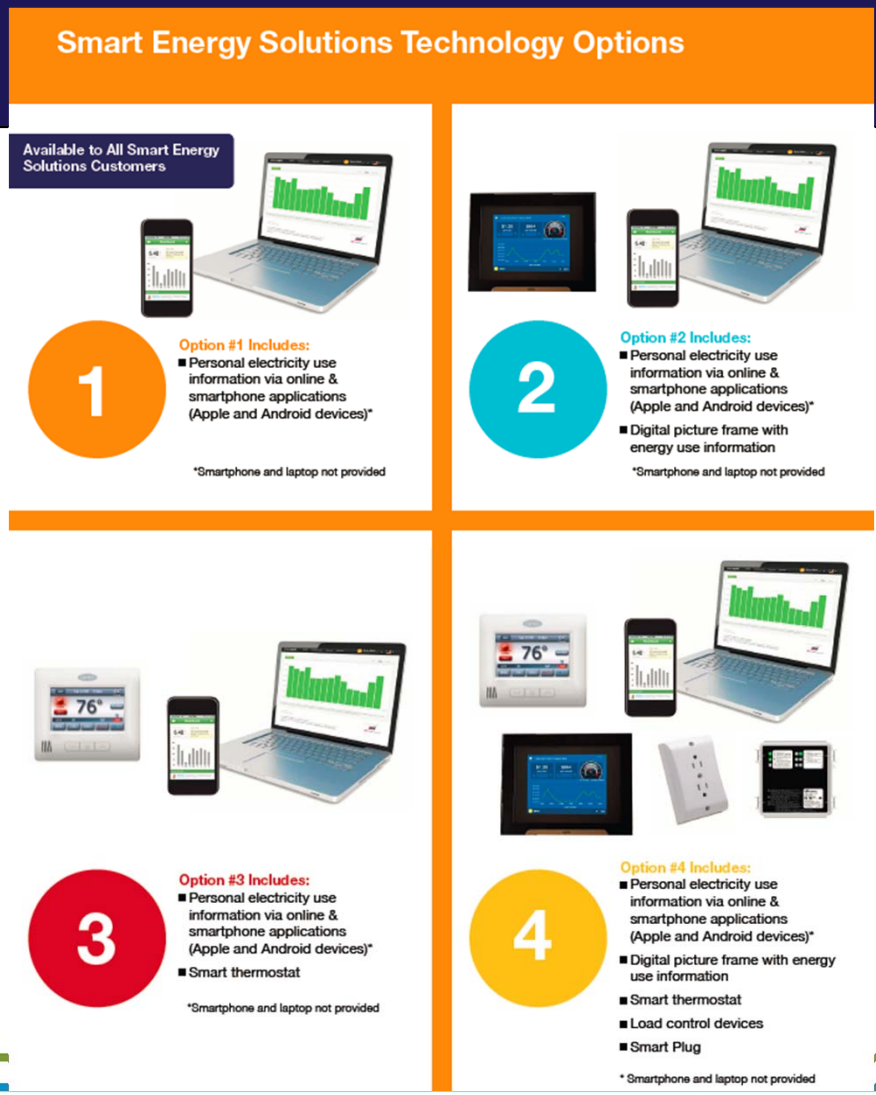


Program Naming Conventions for Customers

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Program Name: "Smart Energy Solutions"

Internal Terms	Customer Terms
Pricing Programs	
CPP	Smart Rewards Pricing
PTR	Conservation Day Rebate
Pricing Terms	
Critical Peak Event or DR Event	Peak Event
Day of Critical Peak Event or DR Response Event	Conservation Day
Technology Terms	
Level 1, Level 2, etc.	Option 1, Option 2, etc.
In-home display (IHD) or Home display unit (HDU)	Digital Picture Frame
Programmable Controllable Thermostat (PCT)	Smart Thermostat

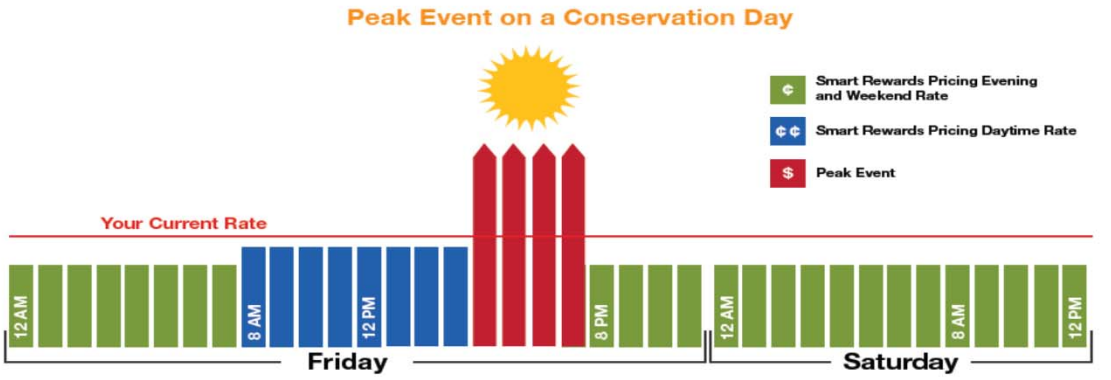


Smart Energy Solutions Events

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- **Conservation Days – Peak Event Days**
  - **Maximum of 175 hours per year or 30 days**
  - **Although primarily summer, should be available year round**
  - **Supports customers with technology independent of their chosen pricing plan**
- **Customers notified via phone call, email or text message the day before a Conservation Day occurs and a reminder the day of event**

This message will include the specific Peak Event hours when you should reduce energy use the next day. Customers can opt-out of a peak event

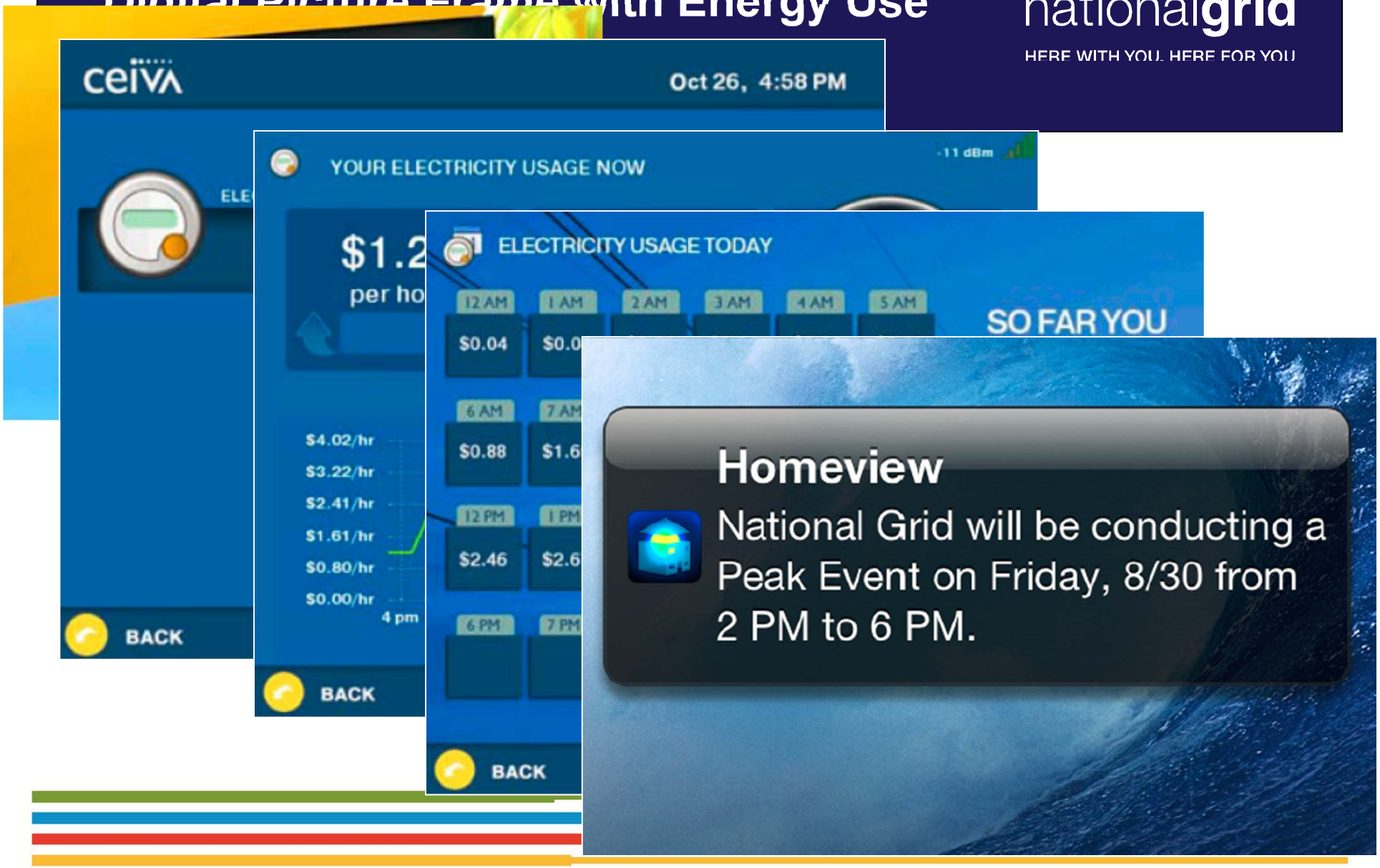


This chart shows an example of a Peak Event. The Peak Events will occur between 8:00 am and 8:00 pm, for 4-8 hours. You will be notified of the exact Peak Event hours the day before the Peak Event.

Digital Picture Frame with Energy Use

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Smart Thermostat – Set it and Forget it!

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- Set your thermostat anytime, any where from a web or mobile app

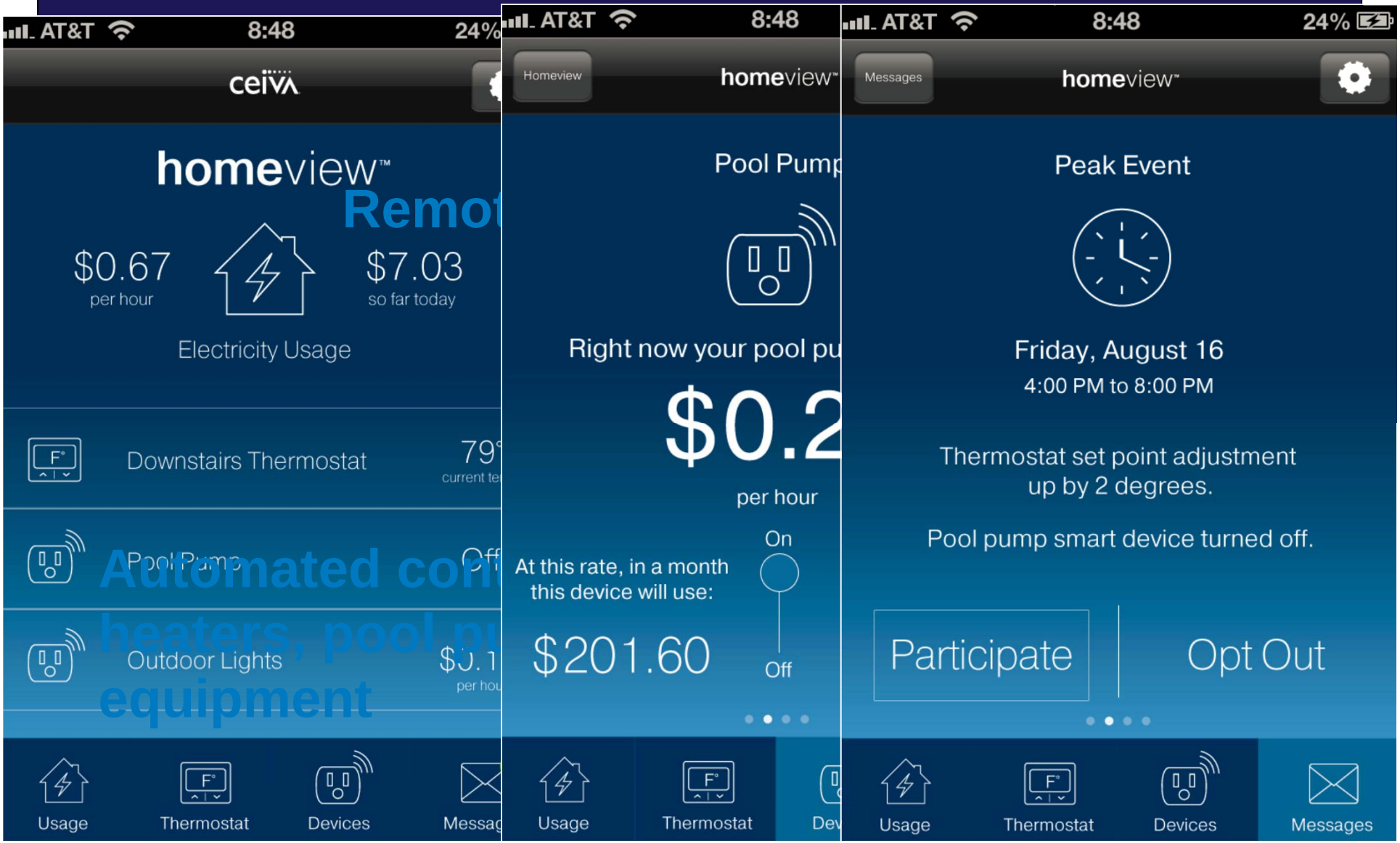
- For instance…turn on your A/C just an hour before you come home, so you don't waste energy, but don't come home to a hot house either

- Easy savings: thermostats will be programmed to save automatically during peak events



Smart Plug and Load Control Devices

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Pilot Challenges

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- Technology is evolving with new products requiring extensive testing
- Security is at the forefront with cyber exposure risk expanding with IP enabled and wireless technologies
- Privacy concerns raised by customers and stakeholders about smart meters and most recently smart appliances and in home technology
- Organizational readiness and capability to maintain and sustain the technology, new procedures, process changes, new skill sets
- Local community lack of familiarity with the new technology (e.g. permitting)
- Managing a multitude of partners and service providers, with many integration points

Communications Experience

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- Recognize site selection and permitting is a local issue (170 communities)
- Leasing can take a long time and is legal intensive
- How are we managing the network going forward
- No longer independent roles for telecommunications, digital network, grid engineering
- Know the limiting factors – (distance, power, back-up, topography, etc.)
- Interference with other equipment

Outreach and Education

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- Many customers do not understand there is an energy market
- Know who the right contact is (sorter vs. decision maker)
- Understand customers may not understand the opportunity
- Know how to maximize the channels
- Why do I need this, what's in it for me?
- What would I do or how would I respond?



Security Journey : The Hard Questions To Ask

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- Do we have effective controls to deal with the threats?
- Which controls are out-of-date or not fit for purpose?
- What controls will we need in the Future State?
- Are existing controls being adhered to?
- How do we continue to ensure the privacy of our customers/employees and the confidentiality of the system data and programs

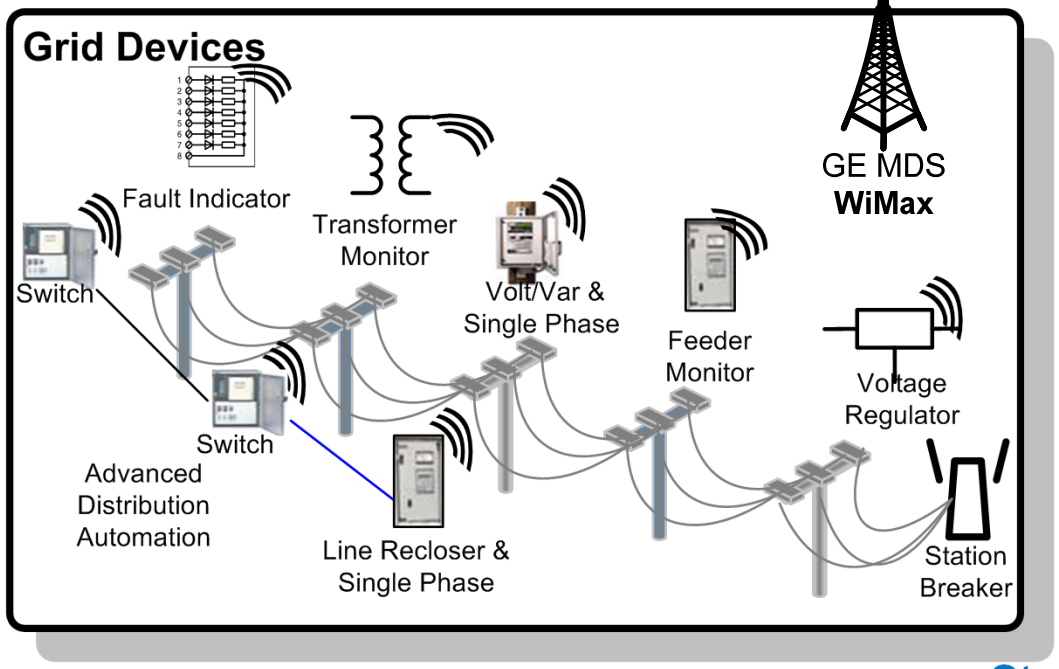
Modernizing the Grid to Benefit Customers

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Two-way Communications ...
Knowing how much load we have in real-time allows better asset and workforce utilization

Potential **Capital Re-deployment** through releasing capacity

Enhanced Reliability
- Finding Outages faster
- Restoring Customers quickly



Power Quality
- Better Voltage
- Energy storage used with critical loads…more perfect power

Enabling
Renewables, Energy Storage, & Electric Vehicles

Improved Storm Performance ...
Knowing who is out of service
Automatically reconfiguring when possible

Thank You

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Questions?

