Cable Telecommunications and the Smart Grid

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Agenda

• Cable’s Value in the Smart Grid
• Energy Management From the Consumer’s Perspective
• Introducing the Open Energy Management Architecture
• CableLabs Security, Monitoring, and Automation Specification
Cable’s Broadband Infrastructure

• $130B invested in cable infrastructure
  – Broadband and Fiber Networks pass 95+% homes, 50+% penetration
  – DOCSIS 3.0 rollout brings speeds up to 160 Mbps
  – Mature security, management, field operations, back office systems
  – Suitable for critical services like voice, home security, energy management

• Today’s cable network infrastructure can support tomorrow’s Smart Grid
  – For Meter Backhaul – from home, from fiber node
  – For Telemetry – to/from devices, for Demand Response and many other energy management applications
  – For Energy Dashboards – eg on TV, on smartphone
But - Cable Can Bring Far More Than A “Pipe” To The Smart Grid

Cable Offers:

• A proven model for industry collaboration between manufacturers, software developers, content providers, and service providers that creates “business class” interoperability
• Data centers and servers to operate and manage Smart Grid applications
• The CableLabs specifications development process proven to enable massive scale and interoperability (>100M cable modems, >25M voice adapters)
• The CableLabs certification process and testing labs
• A public-key cryptography infrastructure securing 100M devices
• Tru2way architecture that allows 3rd party applications to be written for the set-top box
• Cable Information Services (CIS), which operates Go2Broadband
  – A cable industry-wide tool that identifies what cable services are available at an address and links affiliates directly with the cable operator(s) for order fulfillment
Energy Management From the Consumer’s Perspective

Consumers want:

→ to have the **primary control** over energy management decisions
→ to have no limitation on how they receive **pricing signals**
→ to be able to use **any available network(s)**
→ to be able to **shop around** for energy management services, designate an agent to act on their behalf, having the same rights and privileges as the consumer
→ to be able to **customize preferences** to meet individual needs
→ to be able to **read own meter** in real time – wirelessly, in standard format
→ to be able to integrate as needed with **other services**
→ to have an **open market** that fosters competition and innovation
→ To have **no limitations** on the types of sensors, devices, gateways, etc that the customer can purchase and install, as long as it does not interfere with the grid
Energy Management Must Be Real Time

Now

Behavioral Changes
Monthly
Awareness
(Printed Bill)
Consumer

Monthly Feedback Cycle
behavior changes are not reinforced

Better
(with AMI)

Behavioral Changes
Hourly
Awareness
(Online Portal)
Consumer

Hourly Feedback Cycle
behavior changes are somewhat reinforced

Best
(with Broadband)

Behavioral Changes
Real Time
Awareness
(Dashboard)
Consumer

Instant Feedback Cycle
behavior changes are highly reinforced and manageable by device

Key Takeaways: Real time awareness is key to behavioral changes
Real time awareness can only be done by reading own meter
Broadband networks are required to handle data volume.
Smart Grid Architecture Today Is Closed

"End-to-End" Smart Grid
Leading Players by Market Segment

Meter should not be the only type of gateway allowed; should be readable by consumer.

AMI should not be the only type of network considered; broadband and wireless are already in place.

Source: GTM Research
Introducing An Open Energy Management Architecture

• All this means → an Open Energy Management Architecture is needed
• The following Open Energy Management Architecture is a proposed framework driven by these consumer needs
  – Supports innovative application development
  – Removes barriers to market entry for start ups
  – Creates the “virtuous cycle” of innovation and investment
  – Creates competition leading to the most cost-effective solutions
The Open Energy Management Architecture

- Sensors and Devices
- Home Gateway
- Application
- Network Interfaces
- Managed Network
- Application
- Energy Management Service Provider
- Server
- Public Internet
- Utility Servers
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- HAN
- CPE to Network Interface
- AMI Network
- Meter (can enroll in EMSP and/or utility domain)

- Applications Protocol
- Price Query
- Posted Pricing
Key Functions of An Energy Management Service Provider

- Price of energy
- User rules/preferences
- Aggregate meter data
- User dashboard
- Device control

- Utility
- Consumer

- Real time
- Usage data
- Devices, Appliances

- Non-Real Time
- AMR/AMI (optional)
Centralized vs Decentralized Demand Response Model

Centralized Control (Utility Controls Usage)  “Direct Load Control”

- Action
- Awareness

Utility

Decentralized Control (Consumer Controls Usage)  “Distributed Load Control”

- Posted Pricing
- Price Query

Utility

- Sensors and Devices
- Awareness
- Action

Consumer

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Sensors and Devices Must Participate In Several Domains of Control

- Sensors and Devices must be able to participate in multiple domains of authentication and control
- Mature Internet protocols allow logical mappings of these devices into multiple domains (authentication, security, provisioning) so separate networks are not required
  - In the same way that each browser window has a separate secure connection to separate websites
SMA is an architecture that specifies interfaces between an Operator's network and the SMA gateway - an entity that can communicate with, and manage - in-home controls & sensors, including those supporting Energy Management.
SMA Highlights

SMA is based on the proven, scalable, secure, Web and Internet Protocols and Methodologies

HTTP Uniform Resource Identifiers (URIs) for identification of servers and clients (e.g., sensors)
  e.g., https://www.myhome.example.com/mythermostat/temperature

RESTful Web Services, using HTTP, for communication;
  (REST stands for Representational State Transfer)

Transport Layer Security (TLS) for securing communication; X.509 Certificates (using PKI) or Digest (username, password) for authentication

XML for data
XML-based automation controls
XML Schemas for device information

SMA has been included as one of the standards within NIST’s recently released Framework and Roadmap for Smart Grid Interoperability Standards Release 1.0 (draft);
Thank You!

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