The Drive Behind BPL in 2005: Internal Applications and Standards

OUTLINE

Internal Applications
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  – Case Studies

Standards
  – Background
  – Emissions
  – MAC/PHY
  – Media
  – Installation/Hardware
  – Education

Next Steps

Internal Applications Overview

BPL Internal Applications Overview

On the Grid
- Asset Management
  - Power outage notification
  - Predictive maintenance
- Systems Optimization
  - Enhanced SCADA

At the Premises
- Advanced Metering
  - AMR
- Remote Connect/Disconnect
- Load Management
  - Energy management

Utility Applications
- Automatic meter reading
- Capacitor control
- Copper wire system replacement
- Demand prediction
- Detection and diagnosis of events at distribution transformers
- Distribution transformer overload analysis
- Line leading
- Outage localization and fault characterization
- Phase loss detection
- Power quality monitoring
- Safety check for isolated circuits
- SCADA delivery
- Substation monitoring
- URD outage diagnosis

At the Premises Applications
Key Drivers
- AMR
  - Improved demand side information and consumer feedback
  - Regulators desire more reliability and better demand management
- Load Mgmt
  - Energy costs spiking
  - LM technology maturing and equipment costs decreasing
  - Environmental issues (e.g., green power)
  - Good business and good PR with the communities that utilities serve.

On the Grid Applications
Key Drivers cont’d
- Asset Management
  - Post August 14 concerns
    - Reliability, maintenance
    - Stray voltage
- Systems Optimization
  - Visionary smart grid efforts by EPRI and CEA
  - Enormous potential cost-savings opportunity from these applications
Over $30 million per year can be generated in utility savings through the implementation of a BPL system in a sample Tier 1 market…

Internal Applications
Estimated Savings
Over $30 million per year can be generated in utility savings through the implementation of a BPL system in a sample Tier 1 market…

ConEdison

- Distribution Asset Management
  - Predictive Maintenance
- Systems Optimization
  - Advanced SCADA
- Load Management
  - Deferred Substation costs
- Activities
  - Deploying in Steam Tunnels for remote sensors, VoIP
  - Suburban deployment testing outage management

BPL could enable utilities to migrate away from schedule-based maintenance, improve safety and customer service.

Estimated efficiency gains – 30/50/80% examples

<table>
<thead>
<tr>
<th>Efficiency Level</th>
<th>30%</th>
<th>50%</th>
<th>80%</th>
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</thead>
<tbody>
<tr>
<td>U/L Labor &amp; Maintenance/Ft</td>
<td>$71</td>
<td>$71</td>
<td>$71</td>
</tr>
<tr>
<td>Cost/Device</td>
<td>$5,000</td>
<td>$5,000</td>
<td>$5,000</td>
</tr>
<tr>
<td>Feet/Device</td>
<td>1,900</td>
<td>1,900</td>
<td>1,900</td>
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<tr>
<td>Vintage Coverage Area (Ft)</td>
<td>377,211</td>
<td>377,211</td>
<td>377,211</td>
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<tr>
<td>Efficiency Potential for Cov Area (Ft)</td>
<td>113,163</td>
<td>188,606</td>
<td>301,769</td>
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<tr>
<td>Total that could be re-migrated</td>
<td>$1,244,796</td>
<td>$2,074,661</td>
<td>$3,319,457</td>
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<tr>
<td># of devices</td>
<td>251</td>
<td>251</td>
<td>251</td>
</tr>
<tr>
<td>Cost of Devices</td>
<td>$1,257,370</td>
<td>$1,257,370</td>
<td>$1,257,370</td>
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<tr>
<td>Benefit (Detriment) of implementation</td>
<td>($12,594)</td>
<td>$817,291</td>
<td>$2,062,087</td>
</tr>
</tbody>
</table>

Predictive Maintenance

BPL enable utilities to migrate away from schedule-based maintenance, improve safety and customer service.

Underground Sensors

BPL could support IEDs and EPRI “Fault Anticipator” applications. Also security implications.
HECO

- Advanced Metering
  - TOU rates, remote data collection
  - Labor productivity enhancements
- Load Management
  - Water heaters, air conditioners
- Activities
  - Led effort to develop a low-cost IP-addressable meter.
  - Testing advanced metering

Activities

- Ramping up from limited tests in residential environment to test wider utility applications
- Demonstrations held for PUC, DBEDT, Military, Local CLECs/ISPs, Verizon, Oceanic, Media, Developers, Hospitality Industry

DUKE POWER

- Metering
  - Read existing meters
  - Load Research
  - Price Signals
  - Pre-Paid metering
  - Service Disconnect
  - On-Demand Reads
  - Outage restoration
  - Gas & Water readings
- Distribution Optimization
  - Bank Meters
  - Substation Equipment
  - Distribution equipment
  - Capacitors
  - Relays
  - End of circuit
  - Voltage
  - Outage Detection
  - Fault Location

UPLC Internal Applications Committee

- UPLC Driving Development of Internal Applications
  - Chair: Tim Frost, ConEdison
  - UPLC Annual Conference, Winter Conference
    - Identifies applications, creative solutions
  - Next steps
    - Information collection/sharing
    - Collaborative solutions

Activities

- ITRON ERT meter collector
  - Enables hybrid AMR solution leveraging existing infrastructure
  - Enables electric, gas and water meter reads
- Form 9 Polyphase transformer rated IP meter
  - Replacement for exception route meter
  - Enables remote reading and programming
- Switched capacitor bank control model
  - Existing utility equipment
  - Enables remote reading and programming
- Security camera at substation
  - New utility application
  - Remote monitoring of facilities
Standards Overview and Update

Background

• IEEE BPL Working Group focused on hardware/installation standards for BPL (P1675)
• IEEE BPL Study Group formed in 2004 to explore other possible standards for BPL
  – Meetings:
    – Piscataway, NJ, Oct. 13, 2004
      – Attendance: approximately 20
      – Tasks: develop communications, whitepaper
    – San Diego, CA, Jan. 14, 2005
      – Attendance: approximately 40
      – Tasks: develop PARs, continue work on whitepaper
• Other developments
  – HomePlug Access BPL standard
  – Universal Powerline Alliance
  – CE-Powerline Alliance

Emissions

• Leadership: Aron Viner, Ambient
• Approach: technical, not regulatory
• Going forward:
  – Support ongoing standards efforts related to emissions at ETSI, CENELEC and CISPR
  – Compatibility w/ wireline & wireless devices
• Benefits:
  – For manufacturers: measurement methods
  – For operators: help detect, mitigate interference

MAC/PHY

• Leadership:
  – Jim Mollenkopf, Current Technologies
  – Jean-Philippe Faure, Illevo-Schneider Electric
• Approach: ComSoc-led effort, overseen by Study Group
• Going forward:
  – Representatives from various standards groups working together
  – Draft PAR for compatibility b/w in-home & access.
• Benefits:
  – Coexistence and interoperability
  – Scale

Media

• Leadership: Bruce Renz, Amperion
• Approach: build on field tests/other efforts
• Going forward:
  – Draw from ETSI, OPERA, EPRI and academic efforts
  – Develop common techniques for ways to measure/predict channel performance
• Benefits:
  – Serve as a guide for improving BPL performance and interference mitigation

Installation and Hardware

• Leadership:
  – Terry Burns, APS
  – Yehuda Cern, Ambient
  – Cindy Bambini, Ameren
• Approach: Work w/in existing standards to the extent possible
• Going forward:
  – Subgroups for hardware and installation
  – Needs utility participation
• Benefits:
  – Promotes safety
  – Lowers cost
Education

• Leadership: John Newbury, Open University
• Approach: Practical
• Going forward:
  – Develop Recommendation
  – Support from academics/industry
• Benefit
  – Qualified workforce

Conclusions

• Internal applications are in development and will be critical to utility adoption and widespread deployment of BPL
• Standards efforts coalescing under IEEE.
  – Removes uncertainty
  – Improves performance
  – Drives equipment production and interoperability
• UPLC next steps
  – BPL Symposium; IEEE Study Group Mtg. at UTC Annual Conference, May 22-25, Los Angeles, California
  – 2005 BPL Business Case Study

Questions?

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