The Drive Behind BPL in 2005:

Internal Applications and Standards

OUTLINE

- Internal Applications
  - Overview
  - 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 capacitors and regulators
- Distribution transformer overload analysis
- Line testing
- 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

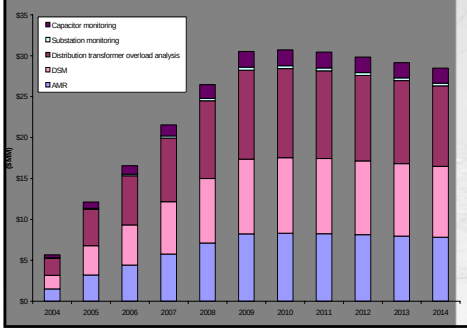
- AMR
  - Improved demand side information and consumer feedback
  - Regulators desire more reliability and better demand management
- Load Mgmt
  - Energy costs spiking
  - LM technology maturing and equipment costs decreasing
  - Environmental issues (e.g., green power)
  - Good business and good PR 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

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…



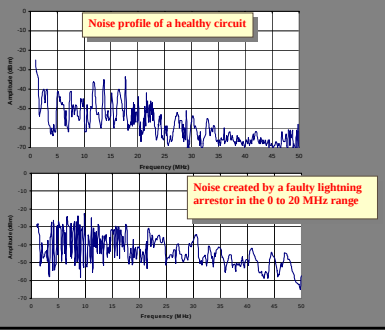
Internal Applications BPL Case Studies

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

Predictive Maintenance

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



Estimated efficiency gains – 30/50/80% examples

Efficiency Level	30%	50%	80%
UG Labor & Maintenance/Ft	$ 11	$ 11	$ 11
Cost/Device	$ 5,000	$ 5,000	$ 5,000
Feet/Device	1,500	1,500	1,500
Vintage Coverage Area (Ft)	377,211	377,211	377,211
Efficiency Potential for Cov Area (Ft)	113,163	188,606	301,769
$ that could be redirected	$ 1,244,796	$ 2,074,661	$ 3,319,457
# of devices	251	251	251
Cost of Devices	$ 1,257,370	$ 1,257,370	$ 1,257,370
Benefit (Detriment) of implementation	$ (12,574)	$ 817,291	$ 2,062,087

Underground Sensors

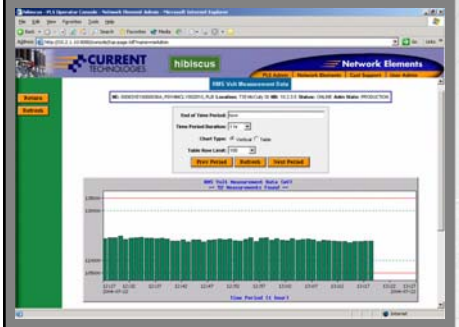
BPL Could Support IEDs and EPRI "Fault Anticipator" applications. Also security implications.

Source: GridCom International

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

Advanced Metering Low Voltage Monitoring



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
  - Reclosers
  - End of circuit Voltage
- Outage Detection
- Fault Location

Activities

❶ ITRON ERT meter collector
- Enables hybrid AMR solution leveraging existing infrastructure
- Enables electric, gas and water meter reads

❷ Form 9 Polyphase transformer rated IP meter
- Replacement for exception route meter
- Enables remote reading and programming

❸ Switched capacitor bank control model
- Existing utility equipment
- Enables remote reading and programming

❹ Security camera at substation
- New utility application
- Remote monitoring of facilities

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

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 recommendations, 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, Ilevo-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?

Brett Kilbourne
Dir. of Regulatory Services & Associate Counsel
United Power Line Council
1901 Pennsylvania Avenue, NW
Fifth Floor
Washington, DC 20006
(202)833-6807
www.uplc.org