

Broadband Over PowerLine (BPL) Pilot Project

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BPL Project Scope

Implement a BPL network for delivery of the following Utility Services:

- Electric Grid Monitoring and Outage Detection
- Electric and Water Meter Reading)
- Utility Portal

BPL Project Scope

Implement a BPL network for delivery of the following Consumer Services:

- Video on demand
- Internet service and telephony (VOIP)
- Home security

BPL Pilot Network Area

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BPL Network Deployment

- Pilot location selected via several criteria – backhaul availability; COA facilities within area; Neighborhood Association; distribution circuit design; hard to read water meters.
- Broadband fiber connection for injection site fundamental to building out network.
- An initial RF analysis was performed to provide a RF baseline & to identify noisy pole and transformer make ready work.

BPL Network Deployment

- Deployed one underground feed requiring extensive make ready work.
- Not able to deploy a underground feed at second location due to the typical configuration of the distribution poles.
- 15 BPL gateways installed passing approximately 200 homes.
- Post installation RF analysis verified all ham radio bands notched and within FCC specifications.
- Major storm on June 20th caused the head end BPL node to go down and resulted in entire network failure.

AMR Deployment

- Deployed 5 electric AMR meters connected via BPL.
- Needed to manually retrofit 4 of 5 meters.
- Overall installations were complicated and expensive.
- Deployed 5 water AMR meters connected to AMR electric meters via wireless.
- Metal covers blocked signal so needed to replace w/plastic covers.
- Overall connectivity problematic due to limited wireless range & standard metal covers.

Consumer Services Deployment

- Deployed 3 Internet phones; 4 Internet kiosks (PCs); 2 cameras & a home security system.
- Security Program allowed Web enabled arm/disarm and turning on and off appliances/lights (in building BPL required).
- Video & camera control available over the Web but resolution adequate for limited video only.
- Network speed fluctuated from 250 KB/s to 750 KB/s but mainly stayed on the high end when a single user.

Consumer Services Deployment

- Kiosk download function performed at the lower rate when competing network resources existed.
- Internet telephony either failed completely (no dial tone) or performed poorly when competing network resources existed.
- Participant surveys indicated low satisfaction from a user's perspective for both Internet and telephony services.

Portal & Network Monitoring

- Portal installed for BPL network maintenance & monitoring.
- Recorded outage on Friday April 13th @ 8:10 P.M.; power was restored @ 9:50 P.M.
- Real time design provided only limited reporting.
- Does not provide for Utility required cyber security nor customization.

RF Testing and ARRL

- BPL operated within FCC regulations w/optional filters added @ 5 MHz & 10 MHz WWV channels at AARRL request.
- ARRL representative conducted independent testing and corroborated results.
- Cycled power to verify filtering remained after power loss.
- Ingress noise test at 40 and 99 watts across spectrum & verified no effect on the BPL signal.
- Identified RF noise so filtered at a 40db (standard is 30db) and virtually disappeared.

Conclusions & Recommendations

- BPL product has made great strides but is in early stages of development.
- RF noise or interference problems can be controlled.
- Network reliability & availability questionable.
- Expensive in comparison w/other available technologies.
- Deployment costs high compared to other technologies.

Conclusions & Recommendations

- BPL network maintenance costs high.
- Limited network speeds if expanding to provide multiple products & services.
- Limited network monitoring & management tools and advanced applications.
- Overall cost \$300,000.