The National Association of Regulatory Utility Commissioners

REPORT OF THE BROADBAND OVER POWER LINES TASK FORCE

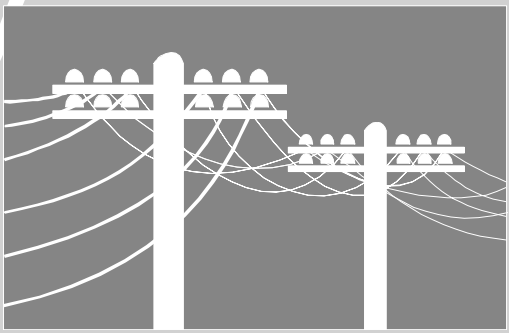
INCLUDING

AN EPRI SOLUTIONS REPORT

UNDERSTANDING UTILITY RESPONSES TO BPL

LITERATURE REVIEW AND UTILITY SURVEY

February 2006



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I. INTRODUCTION

On December 16, 2003, the National Association of Regulatory Utility Commissioners (NARUC) announced the creation of a Task Force charged with exploring the potential for deployment of Broadband over Power Lines (BPL) and, in particular, the potential role of State public utility commissions in advancing the use of this technology. Then NARUC President, the Hon. Stan Wise of the Georgia Public Service Commission, stated that:

> (B)roadband over Power Lines may prove to be the third broadband pipe into residential consumers' homes, providing significant competition for cable modem and DSL service. I am pleased to announce that six extremely capable State regulators have agreed to join this effort. I am charging them with the task of seeing what States can do to complement the investigations of the FCC and the FERC in this area.

Commissioner Wise appointed the following State regulators to the Task Force:

- Hon. Laura Chappelle, Michigan Public Service Commission, Task Force Chair and Vice Chair of the NARUC Committee on Electricity.
- Hon. Tony Clark, President, North Dakota Public Service Commission, Chair of the NARUC Committee on Telecommunications.
- Hon. Thomas J. Dunleavy, New York Public Service Commission, Vice Chair of the NARUC Committee on Telecommunications.
- Hon. Julie Caruthers Parsley, Texas Public Utility Commission, Member of the NARUC Committee on Electricity.
- Hon. Denise A. Bode, Chairman, Oklahoma Corporation Commission, Member of the NARUC Committee on Telecommunications; Chair, Board of Trustees of the NARUC Education and Research Foundation.
- Hon. Connie O. Hughes, New Jersey Board of Public Utilities, Member of the NARUC Committee on Telecommunications.

Special thanks to the Hon. Diane Munns, President of NARUC, for reconfirming the Task Force in 2005, and the Hon. Samuel James Ervin, IV, Chair of the NARUC Committee on Electricity, for his continued guidance and support of the Task Force.

II. OVERVIEW

Over the past two years, NARUC's Broadband over Power Lines Task Force (Task Force) has studied with interest the many facets of the relatively new broadband technology called Broadband over Power Lines (BPL)[1]. Like many commentators and interested parties, State regulators were interested in the technology's potential application as a "last mile" communications technology. It appeared that the technology could be useful as both a competitive option for end-user broadband purposes, as well as enhanced utility applications by the electric companies.

In early 2005, the Task Force released its first report entitled, "Report of the Broadband over Power Lines Task Force (Report)."[2] The Task Force studied the technology, security and regulatory issues surrounding BPL. The Task Force acknowledged the technology's many promises, especially its potential "smart grid"[3] capabilities, but also noted its obstacles, especially the unclear regulatory climate and costs of deployment in rural areas. The Report called for a "light handed" approach to state and federal regulation of the new technology. It also stated its intention of using the upcoming year to further study ongoing BPL pilots and commercial deployments, especially those that relate to rural offerings.

The year 2005 marked an interesting, albeit mixed, year for BPL. The year's highlights saw encouraging signs that BPL may enhance broadband competition and electric utility functionality on a more widespread basis. BPL supporters could point to such developments as commitments to BPL by major media and technology companies, new trial start-ups, new full-scale commercial deployments, and realization of benefits from application of Smart Grid principles. On the other hand, the year brought news that several BPL trials ended unsuccessfully. BPL detractors continued to question the long-term sustainability of the technology, especially when confronted with the faster deployment and superior funding of its two largest broadband competitors, cable television's cable modem service and telecommunications providers' DSL service. Those who contend that BPL interferes with ham radio and other radio applications also maintained their opposition to deployments of certain BPL technologies.

This overview attempts to outline some of the notable BPL-related events of 2005 and early 2006. By no means is it meant to be exhaustive. Numerous press releases, articles, conferences, and events have occurred during the past year discussing the prospect of this rapidly developing technology – far too many to be covered in this report. Moreover, while the BPL Task Force spent the early part of last year continuing its focus on the benefits and challenges of rural deployment of BPL, it has turned its attention during the latter part of the

[1] BPL, generally, refers to the broadband access technology that uses the low and medium voltage electricity grid to transmit voice, data and video.

[2] Source: "NARUC Taskforce on Broadband over Power Lines" (January 29, 2005) URL: http://www.naruc.org/displaycommon.cfm?an=1&subarticlenbr=334.

[3] As noted in NARUC's 2004 BPL Report, *supra*, page 14, the term "smart grid" refers to an electricity transmission and distribution system that incorporates elements of traditional and cutting-edge power engineering, sophisticated sensing and monitoring technology, information technology, and communications to provide better grid performance and to support a wide array of additional services to customers.

year to facilitating and evaluating a small, but targeted, industry survey conducted by the **Electric Power Research Institute (EPRI)**. The results of that study constitute the major portion of this year's Task Force Report.

The Task Force wishes to thank the numerous groups and individuals who gave presentations to the Task Force this year and thereby enhanced our knowledge and understanding of this fascinating technology. We wish to especially thank **Barbara Bauman Tyran, Ellen Petrill, Shawn McNulty, Wade Malcolm,** and all the EPRI family for their professional and thoughtful work in conducting the BPL electric utility survey.

Task Force Presentations

The NARUC BPL Task Force began the year by looking into the viability of BPL in rural areas. On April 18, 2005, the Task Force spoke with **Steven Collier, Vice President, Emerging Technologies, National Rural Telecommunications Cooperative (NRTC).** NRTC and the **Cooperative Research Network (CRN) of the National Rural Electric Cooperative Association** have been jointly studying BPL for the past three years. Initially, the two organizations cooperated on a primer to electric cooperatives on the state of the technology ["Evaluating the Potential for Broadband Over Power Line in the Rural Cooperative Market," 2004]. The report generally acknowledges that the technology works, while it details the economic and technical hurdles that still must be cleared.

In 2005, CRN, with funding support from NRTC, field tested BPL technology. The initial plan was to test equipment from two vendors at two electric co-operatives: **West Florida Electric Cooperative (WFEC),** in Graceville, Florida, and at **Southern Maryland Electric Cooperative (SMECO)**, in Hughesville, Maryland. The WFEC test was canceled due to late equipment delivery. The test at SMECO deployed equipment supplied by **Current Technologies, Inc**., a subsidiary of **Current Communications Group, LLC (Current Communications)**. This test went live on July 3, 2005, and concluded on December 23, 2005. The primary goal of the test was to make an objective assessment of the performance and reach of BPL in a typical electric co-op environment. The testing was done without providing broadband service to consumers, but rather by carefully controlling and varying the information flow on the BPL system and measuring the resulting performance.

CRN-NRTC determined through its technical test that: (1) the Current Technologies BPL system worked reasonably well; and (2) it is a "last-mile" technology. This second conclusion is supported by the performance data collected and has been reaffirmed in a letter dated January 12, 2006 from ACcess Broadband, a firm organized by Current Technologies to market BPL technology to the municipal and electric co-operative market.

On June 1, 2005, the Task Force listened to a presentation on a rural BPL deployment by **Kevin Sump, CEO of South Central Indiana Rural Electric Membership Cooperative (South Central), Scott Lee, CEO of International Broadband Electric Communications (IBEC), and Steve Turner, IBEC's COO.** IBEC is a full service Internet service provider that has partnered with several electric cooperatives to offer dial-up Internet access as well as BPL. IBEC is currently installing high-speed BPL in partnership with **Central Virginia**

Electric Cooperative (Central Virginia) in Nelson County, Virginia and South Central in Martinsville, Indiana. Both entities spoke positively regarding the deployment and are already looking ahead to the deployment of the next generation of BPL technology. IBEC noted that while rural broadband growth remains very low, surveys clearly indicate that this growth is a function of lack of availability, not demand. When asked about interest in broadband services, IBEC states that rural residents respond with the same 40% to 50% interest rate as urban and suburban residents. IBEC notes that two of the commercial deployments of BPL are electric cooperatives (Central Virginia and South Central, above).

On June 23, 2005, the Task Force obtained the insights of **James Lucier, Senior Vice President with Prudential Equity Group.** Referring to the future prospects of BPL, Mr. Lucier noted that, as of yet, there did not seem to be a high public awareness of the technology, especially from an investor's standpoint. He opined that many investors may initially respond skeptically, as it would appear that electric companies were attempting to wander away from their core competence by becoming telecommunications companies. He also referred to a healthy skepticism that regulators would not approve rate recovery for investments in new BPL networks. As with most new endeavors, Mr. Lucier believed that it would be most helpful if BPL vendors and projects were adequately capitalized. He also believed that the Smart Grid capabilities of BPL – in terms of its reliability benefits – were one of its strongest selling points.

Edward Perez, Assistant City Attorney with the Los Angeles Department of Water & Power (LADWP), spoke to the Task Force regarding the early stages of its pilot project that will test the utility applications of BPL. LADWP discussed its goal of improving utility system reliability with the technology. It planned on gathering information throughout the year, with the prospect of moving forward with a vendor by year-end. Mr. Perez stated that LADWP is completing it demonstration project and it appears to be working well.

The Task Force spent early fall working with EPRI on a survey based on a small sample of utilities to gain information on their decisions to use (or not use) BPL technology. EPRI's findings and summary of the outcomes of this effort are included as Part V of this report. A key observation of the EPRI discussion is that regulatory issues do not appear at this time to be a significant obstacle to BPL deployments by the electric utility industry. (See pages 27-28.)

III. INDUSTRY DEVELOPMENTS

Deployments

Brett Kilbourne, with The United Power Line Council, states that currently there are seven commercial deployments and 38 trials involving BPL technology (see map attached as Appendix B). The number of trials is roughly the same as those in 2004 (40), although commercial deployments increased from four to seven.

The majority of these deployments consist of small-scale trials, so that affected utilities and participants can gather information, data, and an understanding of the technology's promise and applications. One start-up venture was **Lighthouse Broadband**, in conjunction with **Consumers Energy Company** in Grand Ledge and St. Johns, Michigan. Lighthouse Broadband has deployed a BPL network in Grand Ledge and intends to provide broadband access on a commercial basis throughout both Michigan communities.

In early 2005, the **City of Manassas**, in Virginia, in partnership with **Communication Technologies**, announced the first commercial deployment of BPL to 12,500 households and 2,500 businesses. In October, 2006, the City of Manassas announced that it had completed its BPL deployment throughout the entire city.

In early January, 2005, **Telkonet** announced that it had been retained to deploy broadband service to the residents of Trump Place in New York City using a BPL technology in conjunction with Microwave Satellite Technologies, an affiliated Internet service provider. Telkonet's BPL technology is designed for multiple tenant facilities and typically does not inject the broadband signal on the public utility's side of the interface with the building's electrical wiring. **Equity Residential**, which manages Trump Place, is extending the technology to other properties.

Two Texas utilities announced BPL deployments in 2006. In June, **CenterPoint Energy** and **IBM** announced a partnership to work together to study BPL technology, in combination with a limited demonstration project in the Houston area. In December, **TXU Electric Delivery (TXU)** announced that it was partnering with Current Communications in an ambitious plan to extend a BPL network to more than two million customers located in TXU's electric service territory, which includes the Dallas area.

Current Communications also noted that in 2005, its partnership deployment with **Cinergy** in southwest Ohio passed more than 50,000 homes.

Many of the utilities conducting trials of BPL are concentrating on the technology's utility applications. For example, **San Diego Gas & Electric (SDG&E)** is focusing on the technology's potential use for remote control of utility equipment, real-time status reports about grid conditions, and compatibility of customer energy usage. **William L. Reed, Senior Vice President, SDG&E,** has stated that "if the technology is compatible with our electric facilities, it may pave the way for a host of utility functions that will benefit

customers, including shorter outages." Current Communications is also running smart grid applications in conjunction with **Hawaiian Electric Company** and **Southern California Edison.**

Retrenchments

In October, 2005, **PPL Corporation** announced that it would be terminating its residential BPL pilot program in the Allentown-Bethlehem area of Pennsylvania. Similarly, in January, 2006, **Idacomm**, a subsidiary of Idacorp, Inc., announced that it would be phasing out its BPL activities in Reno, Nevada, and Boise, Idaho. Idacorp Chief Executive Officer Jan Packwood noted that the company recognizes the "significant long-term potential" of BPL technology, but it does not foresee the "widespread adoption" by electric utilities it believes is necessary for commercialization "anytime soon."

Progress Energy, based in Raleigh, North Carolina, tested BPL in mid-2004, but the company stated it has no plans to deploy the service in the near future. The company will take a "wait and see" approach to see how the industry matures.

Investments and Financial Transactions

On July 7, 2005, Current Communications announced that Google, The Hearst Corporation, and Goldman Sachs had make a joint investment in its BPL business. According to *The Wall Street Journal* (July 11, 2005), the amount of funding invested was on the order of $100 million.

In August, 2005, IBEC announced the approval of the first BPL loan by the **U.S. Department of Agriculture's Rural Utility Service**. The $19.2 million loan will fund the deployment of IBEC's BPL projects for electric cooperatives South Central (Indiana), Central Virginia, and **Cullman Electric Cooperative (Alabama)**.

K. Michael McGrath, Executive Director of Retail Energy Services for the **Edison Electric Institute**, made a general observation that while more investor-owned utilities appear to be interested in broadband technology for utility application purposes, that technology does not necessarily include BPL. Furthermore, utilities see a new investment barrier coming as high fuel prices and rate shock disturb the ability of utilities to manage the risk of cost recovery for investments in any new technology.

IV. REGULATORY DEVELOPMENTS

Several states took legislative or regulatory actions related to BPL in 2005 and early this year. In addition, the Federal Communications Commission (FCC) launched a proceeding on the appropriate statutory classification of BPL-enabled broadband access.

California: On September 8, 2005, the California Public Utilities Commission (CPUC) instituted a rulemaking proceeding to prescribe ratemaking and regulatory treatment for electric utilities that pursue BPL activities.[4] The basis for the proposed rules is the CPUC's statutory authority to grant a class exemption from the requirement to obtain regulatory approval of a lease or assignment of the use of utility property.[5] According to the CPUC, the rulemaking's purposes are to "simultaneously encourage BPL deployment, avoid harm to ratepayers, promote accessibility to broadband networks and ensure competition in the state's developing broadband market."[6]

The CPUC order proposes to promulgate rules that would prescribe the ratemaking treatment of BPL revenues, standards for cost allocation and rate recovery, and affiliate transaction guidelines. The proposed rules would not assert CPUC ratemaking authority over broadband service.[7]

Louisiana: On January 13, 2006, the Louisiana Public Service Commission opened a generic docket to consider the promulgation of rules for all aspects of BPL.[8]

Michigan: In ruling on an application by Consumers Energy for electric rate relief, the Michigan Public Service Commission (MPSC) rejected a proposal to disallow $100,000 of estimated costs incurred by the utility to study BPL's feasibility.[9] In concluding that a disallowance would be unwarranted in the context of preliminary planning for a not-yet-implemented pilot program (encompassing Grand Ledge and St. Johns, Michigan), the order cited the need to evaluate BPL's technological promise for enhancing electric reliability, e.g., network automation, improved utility monitoring and control, and remote meter reading. The MPSC further observed that a ratemaking determination of a fully-deployed BPL program would "require full consideration of such matters as the potential for improvement in the reliability and quality of electric service, the potential risks to ratepayers of devoting material utility resources to a large-scale deployment, and the overall mix of costs and benefits implicit in a technology with multiple usages."[10]

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[4] *Order Instituting Rulemaking concerning Broadband Over Power Line deployment by electric utilities in California*, R.05-09-006 (mailed Sept. 12, 2005).
[5] *See* Cal. Pub. Util. Code §§ 851, 853(b).
[6] *Order Instituting Rulemaking*, R.05-09-006, at 4-5.
[7] *Id*., at 8-13.
[8] *In re: Development of rules and regulations relating to the deployment of Broadband Over Power Lines ("BPL")*, Docket No. R-29270 (La. P.S.C. Official Bull. #845, published Jan. 13, 2006).
[9] *In the matter of the application of Consumers Energy Company for authority to increase its rates for the generation and distribution of electricity and other relief*, Case No. U-14347 (Dec. 22, 2005), at 62-64.
[10] *Id*., at 64.

Nebraska: In June, 2005, the Nebraska Legislature passed LB 645, which prohibits public power suppliers and all other political subdivisions and agencies from providing wholesale or retail broadband services, Internet services, telecommunications services, or video services.[11] The prohibition against public power suppliers providing the services on a wholesale basis terminates on December 31, 2007. Finally, LB 645 creates the Broadband Services Task Force and instructs the task force to study the issues and submit a report to the Legislature and the Governor with findings and recommendations by December 1, 2006.[12]

New York: On January 18, 2006, the New York Public Service Commission (NYPSC) initiated a proceeding to examine regulatory issues relating to the deployment of BPL.[13] Broadband services currently reach approximately 95 percent of New Yorkers. In addition to providing traditional broadband services, BPL may benefit New Yorkers by providing a technology that electric utilities could use to gain instantaneous access to customer and grid-specific telemetry. In commencing the proceeding, the Commission reiterated its long-standing principles that competition is the most efficient way to ensure the provision of quality utility services at reasonable prices and that structural separation of certain assets and operations is the most effective way to prevent potential abuses that may arise when competitive operations are affiliated with regulated utility monopolies.

The NYPSC's order seeks comment from all interested parties by March 10, 2006 on four specific issues:

1. The current status of BPL technology and the implications of likely technological developments, over the next two to three years, on its deployment,
2. The electric and telecommunications safety and reliability issues raised by BPL's use of overhead and underground electric utility facilities,
3. The most workable business models/arrangements for deploying and providing BPL-based services to the public, and
4. The appropriate regulatory framework to encourage the economic development and deployment of BPL technology.

Following the filing and analysis of comments, the NYPSC expects to establish clear and appropriate policies, which should speed use of BPL technology.

Texas: A new law in Texas, SB 5, specifically authorizes a utility's deployment of BPL. SB 5 finds that BPL is in the public interest, that its development is fully dependent upon utilities, and that it is in the public interest to permit, but not require, utilities to offer BPL in conjunction with other entities, which may or may not be affiliates.[14] It allows an affiliated entity to retain revenues and allows the utility itself to recover the capital and operational expenses associated with BPL, particularly to the extent that they are related to internal

[11] Neb. Rev. Stat. § 86-594.
[12] Neb. Rev. Stat. § 86-599.
[13] *Proceeding on Motion of the Commission to Examine Issues Related to the Deployment of Broadband over Power Line Technologies*, Case 06-M-0043 (issued and eff. Jan. 25, 2006).
[14] Tex. Util. Code Ann. § 43.001.

applications.[15] It would also prohibit additional right-of-way fees or permit requirements of the utilities in addition to those that already apply to electric infrastructure.[16]

Federal Communications Commission: On December 23, 2005, The United Power Line Council filed a petition for a declaratory ruling that BPL-enabled Internet access services should be classified as an information service under the Federal Communications Act of 1934, 47 U.S.C. § 151 *et seq.*[17] On January 11, 2006, the FCC issued a public notice setting a schedule and procedural requirements for filing comments on the petition.

[15] Tex. Util. Code Ann. § 43.102.
[16] Tex. Util. Code Ann. §§ 43.054, .101(d).
[17] *In the Matter of the Petition of The United Power Line Council For a Declaratory Ruling Regarding the Classification of Broadband Over Power Line Internet Access Service As An Information Service*, WC Docket No. 06-10.

V. EPRI SURVEY

An EPRI Solutions Custom Report
Understanding Utility Response to BPL

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Understanding Utility Responses to BPL

Literature review and utility survey

February 2006

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Understanding Utility Responses to BPL – Literature Review and Utility Survey

Shawn McNulty, Senior Research Director

Executive Summary

The National Association of Regulatory Utility Commissioners (NARUC) has asked EPRI and EPRI Solutions to help them better understand why some utilities have embraced broadband over powerline (BPL) technology more readily than other utilities – even given similar regulatory environments. NARUC is also interested in answering two related questions – why some utilities view BPL primarily as a technology for internal utility applications while others view it primarily as a way to offer commercial broadband service, and whether or not BPL is truly a cost-effective option for internal utility applications.

This report provides insights into each of these questions based on both a review of existing research as well as a targeted survey of six utilities with differing perspectives on BPL. The literature points to several factors that tend to lead utilities to be proactive with respect to BPL including municipal utility status, geographically compact service territories, existing fiber networks, significant potential for broadband service growth, and a history of successfully offering non-commodity energy services to customers. Existing research has less to say about why some utilities view BPL more in terms of utility applications than commercial broadband services, although the utility's comfort level with moving beyond their core business appears to be an issue. Finally, an EPRI study currently being finalized questions the cost-effectiveness of BPL versus other technologies for advanced grid applications.

The interviews with utilities suggest that one of the primary reasons utilities differ in their BPL strategies is because of fundamental differences in their managements' approach to new business opportunities and risk. Some utilities are simply more willing than others to be technology pioneers, and this often stems from the philosophy of their CEO. Even the most aggressive utilities, however, are risk intolerant compared with other industries. This is why the other factor that emerged from the interviews as a driver of commercial broadband deployment was the ability to partner with a communications service provider that was willing to assume virtually all of the risk (and reward) itself.

Utilities that view BPL primarily in terms of utility applications seem to be motivated by a strong strategic focus on remaining close to their core business. On the question of whether or not BPL is the most cost-effective solution for utility applications, most of the utilities we interviewed said they do not know – and that in most cases it is too soon to know.

Those utilities that are taking a particularly “wait and see” attitude toward BPL cite both their general risk aversion and their doubts about the technology as reasons. Technology doubts center on whether BPL can remain cost-competitive in commercial broadband markets as other technologies advance and whether the promise of BPL for utility applications can be cost-effectively realized given current BPL technology and the lack of effective or standardized tools for integration of BPL with other systems.

Although they acknowledge that regulatory support is important to BPL implementation, all of the utilities we spoke with felt that regulatory concerns pale in comparison with issues of technology performance and business strategy when formulating a BPL plan. The main regulatory issues cited with respect to BPL were clarifying the rules on how utilities and their unregulated subsidiaries can share the costs and benefits of a BPL system and insuring that there are clear rules on how utilities can charge third party BPL providers for access to their poles and wires.

Introduction and Method

Broadband over powerline (BPL) technologies offers a host of new opportunities for electric utilities to leverage their distribution infrastructure. In addition to such utility applications as outage detection and management, automated meter reading (AMR), and demand response programs; BPL allows electric utilities to offer commercial broadband communication services to end-use customers.

In the past two years a number of utilities have launched BPL pilot programs and a handful have moved forward with commercial deployments of BPL services for customers. These efforts have been encouraged by many state and federal regulators as a way of expanding the reach of broadband to consumers. Nevertheless, the pace of utility BPL adoption has been slower than many industry observers had hoped, leading regulators to question what more they could do to encourage BPL deployments.

Objectives and approach

To address this issue, the National Association of Regulatory Utility Commissioners (NARUC) has asked EPRI to help them better understand the varying approaches that electric utilities take toward deploying or not deploying BPL technologies. Specifically, NARUC would like to understand:

- Why some utilities embrace BPL while others are uninterested – even in the same regulatory environment?
- Why some utilities focus primarily on internal applications of BPL (i.e., smart grid) and others view it primarily in terms of offering broadband communications services to customers?
- Do the benefits of BPL for internal utility applications in fact outweigh the costs? Is BPL a cost-effective technology for these applications?

To answer these three key questions staff from EPRI and EPRI Solutions first set out to review existing reports and research already conducted by EPRI, EPRI Solutions, and others that may bear on NARUC's questions. The literature review was designed as the first phase of an investigation that would conclude with new data collection through interviews with targeted utilities. One purpose of the literature review phase was to identify information gaps that would need to be addressed through these interviews.

Key reports cited

The EPRI and EPRI Solutions reports that have the most direct bearing on these issues are:

- Clark Gellings and Karen George, *Broadband Over Powerline 2004: Technology and Prospects*. An EPRI white paper, 2004.
- Karen George, *BPL Market Update and Teleconference Highlights*. A Primen Customer Insights Perspective (CI-PP-10), 2004.
- *Consumer Portal Telecommunications Technology Assessment* (DRAFT, v2). EPRI, 2005.

In addition to these studies, the authors reviewed recent coverage of BPL in both the mainstream and industry press, as well as the websites of major BPL service providers.

Utilities interviewed

Once the literature review was concluded, we interviewed individuals at six US electric utilities concerning their company's BPL strategy and the factors that drove them toward that strategy. The intent of these interviews was to better understand why different utilities take widely differing approaches to BPL (both as a commercial broadband service and as an enabler of utility applications). The interviews also probed specifically on the relative impact of regulation versus other factors in shaping these strategies.

We worked with NARUC's BPL Task Force to select the six utilities likely to give us the most informative responses to these questions. The utilities interviewed, and the individuals spoken with at each utility, are listed below:

- **Cinergy** was chosen because, as the utility with the largest commercial BPL deployment, we viewed their experience as critical to understanding the broader issues. We interviewed Greg Wolf, Vice President of Cinergy Ventures. Mr. Wolf is responsible for Cinergy's commercial broadband ventures in conjunction with Current Broadband.
- **Consumers Energy** was chosen as a utility that has moved forward with a commercial broadband pilot. Gerry Wyse, Manager of Distribution System Planning and Performance for the utility's western region was our respondent from Consumers.
- **South Central Indiana REMC** is a cooperative that has moved forward with a significant commercial broadband deployment. Our contact there was the cooperative's CEO, Kevin Sump.

- **Con Edison** was included as an example of a utility that has historically seen BPL primarily as a utility application. We spoke with Tim Frost, Director of Corporate Planning, at Con Edison.
- **Central Hudson Gas & Electric** was included in the interviews because they had just completed an internal study of their BPL options (summer 2005) that lead them to conclude the time was not ripe to pursue BPL. We interviewed John Chrysler, a Research & Development Administrator at Central Hudson.
- **First Energy** was interviewed as an example of a utility operating in multiple states that has taken a more measured approach to piloting BPL than Cinergy. We spoke with Eileen Buzzelli, Managing Director of New Products at First Energy.

The remainder of this report consists of three sections. The first presents a brief overview of BPL, including the current status of commercial broadband and utility applications. The second covers the preliminary conclusions we drew from the literature on the three key questions guiding this study. The final section summarizes the insights gained from the utility interviews.

Overview of BPL

Broadband over powerline technologies take advantage of the excess capacity that existing electrical distribution lines have to carry signals transmitting data. The technology for low-speed, short-distance data transmission over powerlines has existed for many years, but new technologies allowing high-speed, long-distance data transmission have been developed and tested over the past three to five years. These new technologies enable two broad categories of BPL applications:

- **Commercial broadband services** offered to consumers by electric utilities (either on their own or in partnership with other firms). This could be simply internet access or bundles of services including Voice Over Internet Protocol (VoIP) or video-on-demand.
- **Utility applications** of BPL. These could include any distribution management or customer service function that involves communication over long distances. Examples would include:
    - Automated meter reading (AMR)
    - Automated connections and disconnections

- Outage detection or power quality monitoring
- Load control, demand response, or dynamic pricing
- More sophisticated, integrated communications and control systems as envisioned in EPRI's IntelliGrid concept

The commercial applications of BPL are of particular interest to regulators interested in expanding the geographic reach of broadband communication networks and introducing more competition into the broadband arena. Political leaders, including President George W. Bush, have called for affordable broadband service to be extended to all Americans. The Federal Communications Commission (FCC) has done its part to encourage BPL by issuing rules to help overcome BPL's potential to interfere with radio and telecommunications signals.

Regulatory interest in BPL has primarily been driven by three factors:

- the desire for a "third wire" – a broadband alternative to cable and DSL providers that could introduce additional competition into the broadband market;
- the potential for BPL to extend broadband service to rural areas that are currently underserved; and
- the potential for BPL to enable a more flexible, self-healing power transmission and distribution grid that would be more robust in the face of either natural or man-made disasters, including terrorist attacks.[18]

Status of Commercial Broadband Applications

Commercial deployment of consumer broadband services using BPL began in 2004. The City of Manassas, Virginia was among the first, announcing that they would be making BPL available to customers within their 10-square-mile city limits. By October of 2005 all 12,500 households in Manassas were within reach of the broadband network with 700 customers receiving service and another 500 requests for service being processed.[19]

Two investor-owned utilities (IOUs) also began commercial BPL deployment in 2004. One of these, PPL Telecom (an unregulated subsidiary of PPL Corporation), withdrew from the market in 2005 citing the anticipated high cost of a full-scale BPL deployment and intense

[18] This concept has been developed at some length by EPRI under the "IntelliGrid" label.
[19] "Major U.S. Technology Milestone: COMTek, City of Manassas Deliver First City-Wide Availability of Broadband Over Powerline (BPL) in The U.S." PRNewswire, October 5, 2005.

competition from cable and DSL providers in the area.[20] The other, Cinergy's Current Broadband service, remains in the market. The total number of customers currently served by Current Broadband is not available in the literature, though they had approximately 1,200 customers as of mid-2004. At that point their expansion plans called for exceeding 250,000 homes passed by 2005 with a 20% penetration of homes passed (i.e., roughly 50,000 customers). Current Broadband offers residential service packages ranging from $19.95 a month for 0.5 Mbps to $39.95 a month for 3 Mbps service.[21]

At least three more commercial deployments of BPL have been announced in 2005. The municipal utility of Flatonia, Texas (pop. 1,400) has begun the process of installing a BPL network to serve the town, which had been unable to attract other broadband providers. The town's total investment is expected to be $200,000, or $143 per resident (and probably close to $300 per household passed). The town and its partner, Broadband Horizons, anticipate a price point of $25 a month for subscribers.[22]

A similar city-wide municipal deployment in Princeton, Illinois (pop. 8,000) is currently on hold due to a buyout involving their equipment supplier Main.net. Princeton's initial deployment has been credited with retaining the town's largest employer and securing a $750,000 federal economic development grant.[23]

Finally, the holding company that owns Duquesne Light in Pittsburgh has entered the BPL business through Duquesne Broadband, a joint venture with BPL Global. Duquesne Broadband began a commercial pilot on August 8th offering broadband services to residents in Monroeville.[24]

Perhaps the most positive sign for the fortunes of BPL as a commercial broadband application was the ability of Current Broadband to obtain $100 million in additional financing this past summer. The additional investments came both from existing investors, as well as from Goldman Sachs, Google, and the Hearst Corporation.[25]

Preliminary Conclusions from the Literature

Differential enthusiasm among utilities

Why have some utilities embraced BPL (particularly for commercial broadband applications) while others have not? Although the existing literature cannot provide a

[20] PPL Telecom press release.
[21] http://www.current.net/ServiceAndPricing/Residential/Broadband/PricingAndBenefits/
[22] As reported on National Public Radio's *Morning Edition*, August 16, 2005.
[23] "Princeton, IL, brings 21st century to heartland," *BPL Today*, October 24, 2005.
[24] Press release from Duquesne Broadband; July 21, 2005.
[25] Press release from Current Communications, July 7, 2005.

definitive answer to this question, **those utilities who have demonstrated the most enthusiasm for BPL tend to share some of the following characteristics**:

- **Municipal utility status**. Several of the early adopters of BPL among utilities have been smaller, municipal utilities. These include the City of Manassas, Virginia and Flatonia, Texas. Municipal utilities such as these may be quicker to offer commercial BPL services than investor-owned utilities for two reasons:
    - They face fewer regulatory uncertainties; unlike IOUs, municipals are largely self-regulating when it comes to what services they offer.
    - For a not-for-profit municipal utility there is only one set of stakeholders whose interests must be considered when determining whether to offer broadband – the municipality's ratepayers/taxpayers/citizens (as opposed to IOUs, who must consider both ratepayers and investors). Thus a city can choose to deploy BPL as a community service in situations where an IOU would have difficulty establishing a business case.
- **Geographically compact service territories** that make deployments more cost-effective.
- **Existing fiber networks** that the utility can leverage. Both Cinergy and PPL had extensive fiber networks with excess capacity. BPL was one option for monetizing these networks.
- **Significant potential for broadband service growth**. Those utilities that serve areas with few competitive options for broadband are more likely to consider commercial BPL deployments.
- **A successful history of offering services other than commodity electric power**. Many electric utilities have tried offering non-commodity (and even non-energy) services in the past with mixed results. Those that have had more success (or at least fewer expensive failures) are likely to be more willing to consider a commercial BPL deployment.

Differential utility focus – commercial services vs. utility applications

Although many of the utilities that are the most pro-BPL are pursuing commercial broadband applications, others view BPL primarily as a means to enable various utility applications. What accounts for these differing perspectives on BPL?

An answer to this question is less obvious from the existing literature. In interviews with utility personnel and BPL experts conducted by EPRI Solutions' staff in 2004, the Director of Corporate Planning for Con Edison indicated that his utility is approaching BPL as a utility applications technology out of a desire to stay close to their core business and "what they know." In particular, he noted a lack of understanding of the competitive landscape for broadband and the likely responses of existing broadband suppliers to BPL's market entry as reasons why Con Edison is hesitant to consider commercial applications.

Cost-effectiveness of BPL for utility applications

Just as BPL faces competition from cable and DSL providers in the commercial broadband arena, there are competing technologies for most if not all of BPL's utility applications. Given this, is BPL the most cost-effective approach for utilities looking to enable AMR, automated connections/disconnections, outage detection, demand response programs, or more sophisticated communications and controls?

Although our review of EPRI research did not turn up cost/benefit comparisons for many of these applications, an EPRI report currently being finalized does rank BPL and other technologies with respect to IntelliGrid or "smart grid" applications. More specifically, BPL was rated along with eight other technologies that could be used to enable wide-area networks (WANs) as part of the IntelliGrid architecture.

The criteria used in the ratings included:

- level of standardization,
- ease of obtaining and using the technology,
- current level of adoption,
- degree of users' group support,
- security,
- manageability,

- scalability,
- use of object modeling,
- use of self-description or meta-data,
- applicability to the power industry, and
- applicability to consumer services.

As shown in Table 1, BPL ranked eighth out of the nine WAN technologies considered across these criteria. BPL received particularly low marks on standardization and use of object modeling. It is worth noting that several of the criteria used in this rating are tied to the current state of technology maturation, which accounts for some of BPL's low ranking.

Table 1. Technology ratings for IntelliGrid applications[26]

	Standardization	Openness	Adoption	User's Group	Security	Manageability	Scaleability	Object Modeling	Self-Description	Power Industry	Consumer	**TOTAL**	Bar Graph
Core Networking													
IPv4	3	5	5	4	2	4	4	1	2	3	1	**34**	**********
IPv6	3	5	2	4	4	4	5	1	5	2	1	**36**	**********
TCP	3	5	5	4	2	4	4	1	2	3	1	**34**	**********
UDP	3	5	5	4	1	4	4	1	1	3	1	**32**	**********
HTTP	3	5	5	5	2	3	4	1	4	3	1	**36**	**********
Security													
TLS	3	5	5	4	5	3	4	1	3	3	2	**38**	**********
IPSec	3	5	5	5	5	3	5	1	3	3	2	**40**	**********
HTTPS	3	5	5	5	4	2	4	1	4	3	2	**38**	**********
SSH	2	4	4	3	5	2	2	1	2	2	2	**29**	**********
X.509	5	4	4	1	5	5	3	1	4	3	2	**37**	**********
IEEE 802.11i	5	3	2	5	5	4	2	1	2	2	1	**32**	**********
Management													
Basic IP	3	5	5	4	1	5	4	1	3	3	3	**37**	**********
SNMP	3	5	5	4	2	5	3	4	2	2	2	**37**	**********
CMIP	5	3	2	1	3	5	3	4	2	1	1	**30**	**********
NTP/SNTP	3	5	5	4	1	5	4	1	2	3	3	**36**	**********
IEEE 1588 (PTP)	5	3	2	4	1	5	3	1	2	4	4	**34**	**********
Presentation													
HTML	3	5	5	4	2	5	5	4	4	3	3	**43**	**********
XML	3	5	5	4	2	5	5	5	4	2	2	**42**	**********
BNF	2	5	3	1	1	1	5	5	3	3	3	**32**	**********
ASN.1	5	5	5	1	1	1	5	5	3	3	2	**36**	**********
IEC 61850-6 (SCL)	5	5	2	5	2	5	2	4	4	4	2	**40**	**********
SOAP and Web Service	3	5	4	4	2	5	2	4	5	2	2	**38**	**********
ebXML	5	5	2	4	2	5	2	4	5	2	2	**38**	**********
LANs													
Ethernet	5	5	5	1	3	4	3	1	5	3	2	**37**	**********
Wi-Fi	5	4	4	5	3	4	2	1	5	2	2	**37**	**********
ZigBee	5	4	1	5	4	4	2	1	5	4	4	**39**	**********
Bluetooth	5	4	4	5	2	4	2	1	5	1	1	**34**	**********
HomePlug	3	3	2	5	3	3	3	1	5	2	2	**32**	**********
X10	1	4	5	2	1	1	1	1	5	4	4	**29**	**********
WANs													
DSL	5	4	5	5	4	4	4	3	3	2	2	**41**	**********
Cable	5	5	5	5	4	4	4	3	3	2	2	**42**	**********
WiMAX	5	4	2	5	4	3	3	3	5	1	1	**36**	**********
Access BPL	1	2	2	2	3	2	4	1	2	4	4	**27**	**********
PLC	4	3	4	2	3	2	2	1	1	4	4	**30**	**********
Paging	3	2	5	1	1	2	4	1	5	3	3	**30**	**********
Satellite	2	2	2	1	4	4	3	1	1	3	3	**26**	**********
Cellular	5	1	2	2	3	4	4	3	5	3	3	**35**	**********
FTTH	5	3	2	2	4	4	4	3	3	1	1	**32**	**********
Power System Operations													
DNP3	5	4	5	5	2	1	3	2	3	4	2	**36**	**********
IEC 60870-5-104	5	4	5	4	2	1	3	2	3	5	2	**36**	**********
IEC 61850	5	3	2	5	3	1	3	4	5	5	1	**37**	**********
IEC 61968/61970	5	3	2	4	2	1	2	5	5	5	1	**35**	**********
IEC 60870-6 TASE.2	5	4	5	4	2	1	2	2	2	5	1	**33**	**********
Consumer Application													
ANSI/IEEE C12	5	4	3	2	2	1	4	4	3	5	5	**38**	**********
DLMS/COSEM	5	4	3	5	3	1	4	4	3	5	5	**42**	**********
BACnet	4	4	4	5	2	1	2	2	2	4	5	**35**	**********

[26] Reproduced from *Consumer Portal Telecommunications Technology Assessment (Draft v2),* p. 19. EPRI, 2005. Final report pending.

This same report notes two other concerns with BPL. The first is the high cost of deployment. The second and perhaps more surprising issue is that a lack of electrical current on the power line – such as would occur during a power outage – would disrupt some of the more advanced IntelliGrid functions that wide-area networks would be intended to enable.

Among the IntelliGrid applications that would be disrupted by a power outage if BPL were used as the WAN technology are the ability for grid operators to shed load in an emergency situation with a finer degree of control than is currently possible, to redistribute loads by using demand response customers as a "fast reserve," and to monitor and control distributed generation at a customer's site. Alternative technologies such as WiMAX, radio frequency, paging, or wireless communications could still be active in case of a power outage.[27]

Insights from Utility Interviews

Why some utilities have deployed BPL as a broadband solution

For two of the utilities that have deployed BPL as a commercial service, a **strategic commitment to new services and technology investments on the part of senior management** has been very important. Mr. Wolf from Cinergy noted that their CEO pushes the company to be aggressive on new technology – "from an industry perspective, there have to be pioneers."

Further, the existence of an unregulated subsidiary focused on finding new investments (Cinergy Ventures), was crucial to Cinergy's promotion of BPL for consumer broadband. At the time that Cinergy began BPL deployment, they were uncertain of whether they would be able to obtain regulatory support for cost-recovery if they implemented BPL on the utility side of the house. The fact that they had an unregulated subsidiary tasked with pursuing new opportunities – and that this subsidiary continues to operate when many utilities have abandoned such offshoots – is both a reflection of management's sustained focus on innovation and a key reason that Cinergy is at the forefront of utility broadband activities.

South Central Indiana REMC is currently adding customers to a BPL pilot that has been in operation since October 2004, and is likely to ultimately deploy BPL service throughout their territory. When pressed on why they are moving more aggressively than many other co-ops with similar demographics, Mr. Sump also pointed to their senior management

[27] Didierjean, Anne-Lise (personal communications, December 2005).

(specifically, the membership of their Board of Directors) which has long taken a progressive stance toward diversifying their service offerings.

The other factor that has been crucial to BPL deployment at South Central Indiana REMC (as well as at Consumers Energy) is the **willingness of BPL service providers to partner with the utility and assume virtually all of the risk**. Mr. Sump notes that IBEC, a for-profit company that works with South Central and other co-ops to offer BPL service, owns and operates the BPL hardware. The co-op markets the service, bills for it, and maintains the BPL equipment – but IBEC reimburses them for the maintenance. As a result, Mr. Sump says "we have very little financial risk or reward, which is the way we like it." For them, offering broadband is about providing a service for their members (less than 10% of whom would otherwise have broadband access) rather than making money. At the same time, they would have been hard pressed to invest in BPL themselves given the risks inherent in the broadband market.

Consumers Energy also attributes their involvement in BPL to the willingness of others to assume the risks. In their case the utility was actively courted by BPL service providers starting in the late 1990's. They ultimately told the vendors they were in discussions with that the only way they would proceed was if Consumers Energy did not have to invest any money. When one service provider agreed, they began piloting the service in select cities. Consumers describes their approach as a landlord-tenant model. The broadband provider pays the utility for the right to install their equipment on the utility's poles, then operates and maintains the system. The utility has the right to use any unsold bandwidth on the system for utility applications.

In addition to avoiding financial risk, this arrangement keeps Consumers Energy focused on their core business of power delivery. The only disadvantage Mr. Wyse noted was that, since they do not control where within the pilot areas the equipment is ultimately installed, their ability to leverage the system for utility applications is somewhat constrained.

Why others view BPL primarily as a technology for utility applications

Those utilities that are moving forward with BPL solely or primarily for utility applications appear to be motivated by a strong desire to remain close to their core business and avoid entanglements in markets where they lack experience. As Mr. Frost from Con Edison said, "I'm a utility guy. I have no credibility to determine whether or how to compete with TimeWarner or Verizon." Interestingly, while Con Edison has steered clear of the commercial broadband business, they have begun to identify other "commercial" applications of BPL that are closer to their areas of expertise. For example, although using BPL to facilitate direct load control would normally be seen as a "utility" application,

Con Edison believes that it could create opportunities for their energy services subsidiary. And they have begun to demonstrate how BPL inside a high rise building can be used as the basis for an integrated suite of building management tools that includes intercom and security systems, energy management, and asset monitoring (e.g., chiller and elevator performance).

Views on BPL's cost-effectiveness for utility applications

For most of the utilities interviewed, the jury is still very much out on whether or not BPL is the most cost-effective technology for any given utility application. This is true even for those utilities like Con Edison and First Energy that are focusing most of their BPL efforts on utility applications. Con Edison's Frost notes that BPL does not improve the business case for automated meter reading (AMR), which is the only application most utilities really focus on. He believes that many utilities were interested in BPL for AMR because their regulators were pushing them to consider AMR, but lost interest once they realized the cost of implementation.

Virtually none of the utilities we interviewed were willing to state an opinion on whether BPL would be the most cost-effective option for other utility applications (besides AMR). Most noted that it is still too early to know and that this is one of the things that they are looking to current BPL trials to demonstrate.

Why some utilities are moving slowly on BPL deployment

The utilities we interviewed that are still taking a wait-and-see attitude toward BPL (or proceeding very cautiously) cited two primary reasons. The first is their general **risk aversion**. Central Hudson typified this perspective. The utility completed an internal evaluation of their BPL options in July 2005. The study concluded that it would be premature for Central Hudson to begin a BPL pilot program. The key reason cited was that the there are not yet enough utilities (especially smaller, investor-owned utilities) actively involved in the market. Central Hudson believes that they do not have the size or resources to risk being on the "bleeding edge" of technology deployment. Interestingly, Central Hudson is not averse to investing in new business opportunities – they simply believe that it is too soon to consider BPL for such an investment. This is both because the business models have not been proven and because they still have concerns about the technology itself.

A healthy sense of the risks involved in the BPL market is not limited to smaller utilities. First Energy, for example, characterizes their approach as "careful pilots, careful implementation." They are focusing primarily on utility applications because this keeps them close to their core business. Even here, however, they are moving with deliberation given the current state of the technology.

Indeed, the other factor commonly cited by utilities that are moving slowly on BPL is **doubts about the technology**:

- **Central Hudson** is not convinced that BPL can be cost-competitive in the broadband market today and is concerned that it may be a "dead-end" technology (i.e., other broadband technologies are poised to achieve significant increases in speed that BPL may not be able to match). They have also been unimpressed with the sound quality they have observed in demonstrations of BPL-based Voice-over-Internet Protocol (VoIP) applications.

- **First Energy** commented that it is still not clear that BPL technologies live up to their hype. Currently BPL cannot do anything for utility applications that other technologies cannot also do; the really interesting utility applications of BPL are largely undeveloped concepts. Finally, they noted that tapping into much of BPL's potential requires middleware and tools that have not yet been developed.

- **Con Edison** noted that the technology still has "credibility issues. Don't tell me what it can do; show me what it can do." The fact that the industry is always waiting for "the phantom next generation technology" that will be better makes it hard to justify investment in the current technology. What is needed, in Con Edison's view, is a standard, widely-adopted technology with capabilities that exceed current BPL technology.

- Even **Cinergy** acknowledges that there are still scaling issues plaguing the utility applications of BPL and that integrating BPL with electricity meters is a significant problem. At the same time, Cinergy believes that by installing BPL for current utility applications (even if another technology could perform equally well) utilities gain the advantage of extra bandwidth that will be useful in the future for more advanced utility applications (such as Intelligrid or Smart Grid applications).

Regulatory issues as a factor in BPL decisions

Although one utility cited a specific regulatory issue that had an influence on their BPL strategy, **none thought that regulatory matters were a strong driver of their approach to BPL**. Rather, there was general agreement that the technical characteristics of BPL technology and business considerations such as likely ROI and management's level of risk tolerance were the primary drivers of utilities' BPL strategies. Consumers Energy did point to the existence of a tariff to accommodate the leasing of poles to third

parties as having helped facilitate their business arrangement with a BPL provider. And Cinergy highlighted the importance of clear rules on how utilities and their unregulated subsidiaries can share the cost and benefits of a BPL system.

Conclusions

This report provides insights into utility approaches regarding BPL. The literature points to several factors that tend to lead utilities to be proactive with respect to BPL including municipal utility status, geographically compact service territories, existing fiber networks, significant potential for broadband service growth, and a history of successfully offering non-commodity energy services to customers. Existing research has less to say about why some utilities view BPL more in terms of utility applications than commercial broadband services, although the utility's comfort level with moving beyond their core business appears to be an issue. Finally, an EPRI study currently being finalized questions the cost-effectiveness of BPL versus other technologies for advanced grid applications.

The interviews with utilities suggest that one of the primary reasons utilities differ in their BPL strategies is because of fundamental differences in their managements' approach to new business opportunities and risk. Some utilities are simply more willing than others to be technology pioneers, and this often stems from the philosophy of their CEO. Even the most aggressive utilities, however, are risk intolerant compared with other industries. This is why the other factor that emerged from the interviews as a driver of commercial broadband deployment was the ability to partner with a communications service provider that was willing to assume virtually all of the risk (and reward) itself.

Utilities that view BPL primarily in terms of utility applications seem to be motivated by a strong strategic focus on remaining close to their core business. On the question of whether or not BPL is the most cost-effective solution for utility applications, most of the utilities we interviewed said they do not know – and that in most cases it is too soon to know.

Those utilities that are taking a particularly "wait and see" attitude toward BPL cite both their general risk aversion and their doubts about the technology as reasons. Technology doubts center on whether BPL can remain cost-competitive in commercial broadband markets as other technologies advance and whether the promise of BPL for utility applications can be cost-effectively realized given current BPL technology and the lack of effective or standardized tools for integration of BPL with other systems.

Although they acknowledge that regulatory support is important to BPL implementation, all of the utilities we spoke with felt that regulatory concerns pale in comparison with issues of technology performance and business strategy when formulating a BPL plan.

The main regulatory issues cited with respect to BPL were clarifying the rules on how utilities and their unregulated subsidiaries can share the costs and benefits of a BPL system and insuring that there are clear rules on how utilities can charge third party BPL providers for access to their poles and wires.

APPENDIX A

CHRONOLOGY OF BPL TASK FORCE ACTIVITIES

This appendix provides a brief chronology of the BPL milestones during 2005.

February 7, 2005	Effective date of FCC rules addressing radio frequency interference issues. *In the Matter of Amendment of Part 15 regarding new requirements and measurement guidelines for Access Broadband over Power Line Systems and Carrier Current Systems, including Broadband over Power Line Systems*, 70 Fed. Reg. 1360 (2005).
February 14, 2005	NARUC BPL Task Force releases BPL report at NARUC Winter Meetings in Washington, DC.
June 6, 2005	Nebraska enacts L.B. 645, which bars publicly owned electric utilities from providing broadband service and establishes task force to study broadband issues.
July 7, 2005	Current Communications receives capital investment from Goldman Sachs, Google, and Hearst.
July 11, 2005	CenterPoint Energy and IBM announce partnership to explore BPL opportunities. CenterPoint announces BPL pilot program in Houston, Texas.
July 18, 2005	NARUC representatives meet with FERC/FCC Commissioners for progress update on NARUC BPL Task Force concerns.
August 18, 2005	IBEC secures approval of $19.2 million USDA Rural Development loan to finance ongoing deployment of BPL networks for South Central Indiana Rural Electric Membership Cooperative, Central Virginia Electric Cooperative, and Cullman Electric Cooperative.
September 7, 2005	Texas enacts S.B. 5, which establishes regulatory framework for BPL.
September 8	California Public Utilities Commission commences BPL rulemaking to prescribe ratemaking and regulatory treatment for electric utilities. Order Instituting Rulemaking concerning Broadband Over Power Line deployment by electric utilities in California, R.05-09-006 (mailed Sept. 12, 2005).
October 28, 2005	Seema M. Singh, Ratepayer Advocate of the State of New Jersey, releases "Broadband Over Power Lines: A White Paper" (available at www.rpa.state.nj.us/BPLwhitepaper.pdf), which provides an overview and assessment of regulatory issues facing both the FCC and state commissions.
October 3, 2005	PPL Corporation announces that it is terminating its residential BPL pilot in the Allentown-Bethlehem PA area, effective Oct. 31, 2005.
October 5, 2005	City of Manassas, Virginia completes a city-wide BPL infrastructure deployment through a public-private partnership with Communication Technologies, Inc.
October 13, 2005	The United Telecom Council becomes the new manager of the access BPL database mandated by the FCC's October 2004 BPL interference mitigation order.

December 6, 2005	Lighthouse Broadband commences BPL service using distribution facilities of Consumers Energy Company in Grand Ledge, Michigan.
December 19, 2005	TXU Electric Delivery and Current Communications announce agreement to provide BPL capabilities, including automated meter reading, smart grid capabilities, and broadband Internet access, in its Dallas-based service territory.

State Commissioners Appointed to Task Force

- Laura Chappelle (MI)
- Thomas Dunleavy (NY)
- Julie Parsley (TX)
- Tony Clark (ND)
- Denise Bode (OK)
- Connie Hughes (NJ)

With assistance from:

- Jimmy Irvin (NC)
- Alan Schriber (OH)
- Charles Gray (NARUC)

Federal Commissioners that have participated in Task Force efforts

- FERC Commissioner Nora Brownell
- FCC Commissioner Kathleen Abernathy

Staff Support for the Task Force

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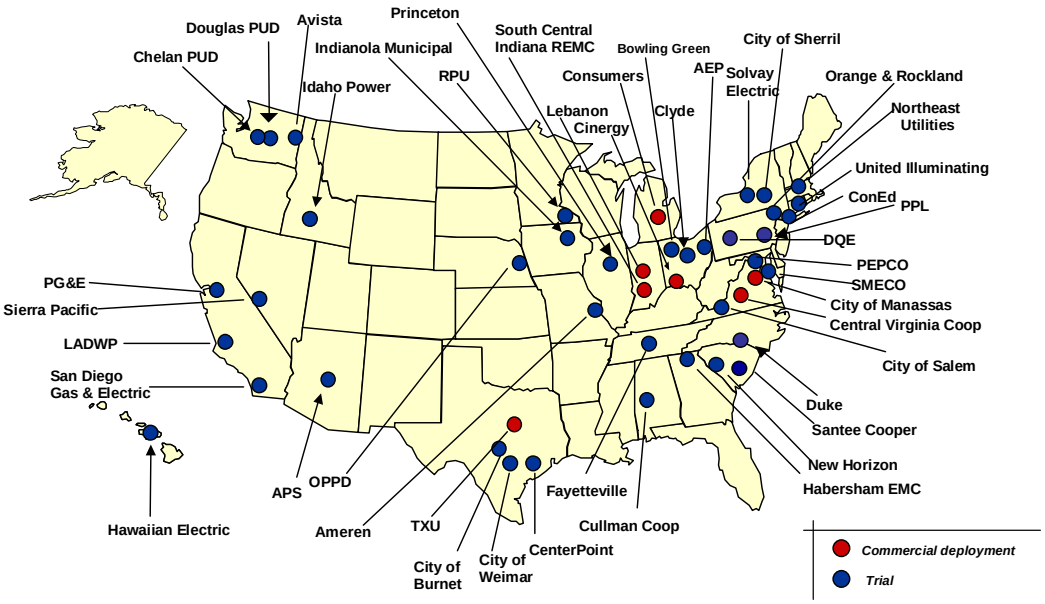
- Joseph Witmer (PA)
- Bridget Headrick (TX)
- Barbara Pennington (TX)
- Brad Ramsay (NARUC)
- Debra Scott (NARUC)

APPENDIX B

BPL Deployment Map



Map provided and updated courtesy of the United Power Line Council (http://www.uplc.utc.org/). NARUC wishes to express its appreciation to UPLC's counsel Brett Kilbourne for permission to include this map in our report.