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Broadband over Powerlines: Regulatory and Policy Issues

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Broadband over Powerlines: Regulatory and Related Issues

Summary

Congress has expressed significant interest in increasing the availability of broadband services throughout the nation. Broadband over powerlines (BPL) has the potential to play a significant role in increasing the competitive landscape of the communications industry as well as extend the reach of broadband to a greater number of Americans. BPL, like any technology, has its advantages and disadvantages. Proponents state that BPL is less expensive to deploy than the cable and telephone companies' broadband offerings; it does not require upgrades to the actual electric grid; and, it is not limited by some technical constraints of its competitors. However, critics are concerned that BPL interferes with licensed radio frequencies used for amateur radio, government, and emergency response.

In October 2004 and October 2006, the Federal Communications Commission (FCC) adopted a Report and Order (R&O) (FCC 04-245) Memorandum Opinion and Order (MO&O) (FCC 06-113) on BPL issues. In October 2006, the American Radio Relay League notified the U.S. Court of Appeals for the D.C. Circuit that it was appealing certain aspects of the FCC's October 2004 R&O and August 2006 MO&O. In October 2006, the FCC declared BPL-enabled Internet access service to be an information service, which places BPL-enabled Internet access service on an equal regulatory footing with other broadband services, such as cable modem service and DSL Internet access service. In May 2007, the American Radio Relay League (ARRL) petitioned the U.S. Court of Appeals for the DC Circuit to review the FCC's October 2004 R&O and 2006 MO&O. In its brief, the ARRL contends, among other things, that the FCC's actions in adopting rules to govern unlicensed BPL systems fundamentally alter the longstanding rights of radio spectrum licensees, including amateur radio operators. Reply briefs were filed in July 2007.

In January 2007, Representative Mike Ross introduced H.R. 462, the Emergency Amateur Radio Interference Protection Act, which would require the FCC to conduct a study on the "interference caused by broadband Internet transmission over powerlines." The bill was referred to the Committee on Energy and Commerce Subcommittee on Telecommunications and the Internet on February 2, 2007; no further action has been taken.

In August 2007, the House of Representatives passed H.R. 3221, the New Direction for Energy Independence, National Security, and Consumer Protection Act. If signed into law, Section 9113(a)(8) would require an assessment by a newly established Grid Modernization Commission to determine, biannually, the progress being made toward modernizing the electric system, including an "assessment of ancillary benefits to other economic sectors or activities beyond the electricity sector, such as potential broadband service over power lines."

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Broadband over Powerlines: Regulatory and Policy Issues

Background

Congress has expressed significant, ongoing interest in increasing the availability of broadband[1] services throughout the nation, both in expanding the geographic availability of such services (e.g., into rural as well as more urban areas), as well as expanding the service choices available to consumers (e.g, promoting additional service options at reasonable prices).

The telephone, cable, and satellite industries, and more recently the electric utilities, all provide broadband services to consumers. Electric utilities have long had the ability to send communications over their powerlines through what is called powerline communications (PLC) technology, but that capability was used primarily to maintain the operability of the power grid — remote monitoring of the grid and other management functions. It was not offered as a commercial product because of technical limitations and regulatory limitations under the 1935 Public Utility Holding Company Act (PUHCA).[2] Specifically, regarding regulatory limitations, PUHCA prohibited electric utilities from entering the retail telecommunications market without all of their operations, including the telecommunications component, being regulated by the Securities and Exchange Commission under PUHCA. However, in 1996, driven by the elimination under the Telecommunications Act of the PUHCA

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[1] The FCC currently defines "broadband" as a service or facility with an upstream (customer-to-provider) and downstream (provider-to-customer) transmission speed of more than 200 kilobits per second (kbps); it uses the term "high-speed" to describe services and facilities with over 200 kbps capability in at least one direction. Broadband is also different from narrowband modem service in that it is "always on," meaning there is no need to dial up. See *Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996* (CC Docket No. 98-146), Report, February 6, 2002. This document is available online at [http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-02-33A1.pdf]. For further information about broadband and broadband deployment, see CRS Report RL33542, *Broadband Internet Access: Background and Issues*, by Angele A. Gilroy and Lennard G. Kruger.

[2] Public Utility Holding Company Act (PUHCA) of 1935, 49 Stat. 803, (1935), 15 U.S.C. Section 79, *et seq*. PUHCA also addresses issues such as cross-subsidization, the subsidization of competitive services with profits from regulated services, which could become an issue as BPL is deployed more widely. Cross-subsidization within the electric industry, however, is not an issue for the FCC and is beyond the scope of this report. For a detailed description of PUHCA, see CRS Report RL32728, *Electric Utility Regulatory Reform: Issues for the 109th Congress*, by Amy Abel.

limitations[3] and the increasing demand for broadband services, electric utilities began exploring ways to turn PLC into a commercially viable, consumer service — Broadband over Powerlines (BPL).[4]

Many electric companies are now in the process of upgrading their transmission and distribution systems to provide BPL.[5] This technology has the potential to play a significant role in increasing the competitive landscape of the electric utility and telecommunications industry, as well as making broadband available to more Americans than ever before. BPL, however, like any technology, has its advantages and disadvantages. For example, BPL, in general, is less expensive to deploy than the cable and telephone companies' broadband offerings because it does not require upgrades to the actual electric grid and is not limited by certain technical constraints of its competitors. Specifically, the telephone companies' broadband service, digital subscriber line (DSL), is limited to consumers within 18,000 feet of a central office unless expensive remote equipment is placed close to the customer. Cable companies, while not limited by the same distance restrictions as the telephone companies, still must upgrade their cable plant as well as the equipment at their

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[3] In 1996, the FCC adopted regulations to implement new Section 34(a)(1) of PUHCA. Under new Section 34, registered public utility holding companies may enter the telecommunications industry without prior Securities and Exchange Commission (SEC) approval by acquiring or maintaining an interest in an "exempt telecommunications company" (ETC). Also, exempt public utility holding companies, by owning or acquiring an interest in an ETC, may now acquire a "safe harbor" from potential SEC regulation under PUHCA Section 3(a). *In the Matter of Implementation of Section 34(a)(1) of the Public Utility Holding Company Act of 1935* (GC Docket No. 96-10), Report and Order as added by Section 103 of the Telecommunications Act of 1996, September 12, 1996. The Report and Order is available online at [http://www.fcc.gov/wcb/cpd/other_adjud/Archive/99etc.html].

[4] Two types of BPL exist — "In-house" BPL and "Access" BPL. In-house BPL uses "the electrical outlets available within a building to transfer information between computers and between other home electronic devices, eliminating the need to install new wires between devices. Using this technology, consumers can readily implement home networks." Access BPL provides "high speed Internet and other broadband services to homes and businesses. In addition, electric utility companies can use Access BPL systems to monitor, and thereby more effectively manage, their electric power distribution operations." *Carrier Current Systems, including Broadband over Power Line Systems and Amendment of Part 15 Regarding New Requirements and Measurement Guidelines for Access Broadband over Power Line Systems*, Notice of Proposed Rulemaking, ET Dockets 03-104 and 04-37, FCC 04-29, February 23, 2004, para. 3. Available online at [http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-04-29A1.pdf]. This report addresses only Access BPL and so uses the term "BPL" to mean "Access BPL."

[5] See *Potential Interference from Broadband over Powerline Systems to Federal Government Radio Communications at 1.7-80MHz, Phase 1 Study, Volume I*, Section 9. National Telecommunications and Information Administration Report 04-413 (NTIA Report), April 2004. This report is available online at [http://www.ntia.doc.gov/ntiahome/fccfilings/2004/bpl/ FinalReport Adobe/NTIA_BPL_Report_04-413_Volume_I.pdf]. This report contains an in-depth overview of the technologies and network topologies used to provide BPL with accompanying diagrams.

"head end"[6] to provide cable modem service. Finally, Internet service delivered via satellite is still primarily a downstream-only service, with a dial-up connection required to send data to the Internet. However, critics of BPL have expressed concern that it will interfere with licensed radio spectrum such as amateur radio, government, and emergency response frequencies.

Companies both in the United States and abroad have pilot tested BPL and many are now deploying it commercially. For example, in 2004, Manassas, VA, began testing BPL service and became the first U.S. community with a commercial BPL offering.[7] The service is now being used by roughly 1,000 of the 12,500 households in the Manassas area. However, in Manassas as well as in other areas where BPL is being deployed, there have been some concerns and difficulties. For example, amateur radio operators have stated their concern that BPL will interfere with their radio signals.[8] Efforts are being made by industry and government to address these concerns while still continuing BPL deployment.

In addition to providing new choices for consumers and increased competition in the broadband market, BPL can provide other benefits, both to the electric utilities and to others. As tests and commercial deployments continue, the electric utilities can capitalize on their existing relationships with consumers and the ubiquity of their networks. Also, BPL can be sold either as a retail service under the electric utility's brand or as a wholesale service to third-party ISPs, offering smaller broadband providers another wire to the customer — and electric utilities have expressed interest in providing such open access on a wholesale basis.[9]

Concerns among electric utilities and investors about BPL deployment do remain, however. Although the pilot tests and limited commercial deployments have thus far proven successful, the viability of large-scale commercial implementation remains unproven. Also, while name recognition will help the electric utilities as they roll out their service, there is also concern that they may have an unfair competitive advantage over smaller, less established providers. In this case,

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[6] The head end is "the cable television company's local facility that originates and communicates cable modem and cable TV services to its subscribers. The cable company's head-end includes the [equipment used to provide] high-speed Internet access to cable subscribers. ISP Glossary. Available online at [http://isp.webopedia.com/TERM/C/cable_headend.html].

[7] A thorough overview of the Manassas project is available from the American Public Power Association. Available online at [http://www.appanet.org/legislative/index.cfm?ItemNumber=9860].

[8] The American Radio Relay League commissioned a report on BPL interference that was submitted to the FCC as part of ARRL's comments in the BPL proceeding. This report is critical of BPL deployment and its effects on amateur radio frequencies. *BPL Trial Systems Electromagnetic Emission Tests*, Metavox, Inc. March 20, 2004. Available online at [http://www.arrl.org/announce/regulatory/et04-37/ARRL_04-37_Comments_Exhibit_A.pdf].

[9] "Broadband Over Powerlines," Angel M. Cartagena, Jr., *Electric Perspectives*, March/April 2004. This article is available online at [http://www.eei.org/magazine/editorial_content/nonav_stories/ 2004-03-01- Broadband.htm].

however, this may not be a significant concern because of the size of the established broadband providers, the telephone and cable companies.[10] Finally, although BPL is likely to be deployed further out into rural areas than either cable or DSL, it remains to be seen if BPL is as economical to deploy in those areas as policymakers and rural consumers hope.

The FCC opened a rulemaking proceeding on the technical issues related to BPL deployment in February 2004 and adopted a Report and Order on the proceeding in October 2004 (see "Regulatory Activity — Federal Communications Commission," page 6). Congress may wish to monitor how the FCC implements the rules that will guide BPL development and deployment, as well as monitor more general issues surrounding BPL, such as industry and societal issues, regulatory and industry governance issues, and technical issues. These three categories of issues are discussed in detail at the end of this report (see "Issues for Congress").

Stakeholders

In addition to marketplace competitors and consumers, the key stakeholders in this issue are the BPL industry, amateur radio operators (represented primarily by the American Radio Relay League (ARRL)), and various government entities.

In favor of BPL deployment and the FCC's rules is the BPL industry: the electric power companies, Internet service providers (ISP), BPL equipment manufacturers, BPL system solutions companies (such as Main.net), and the trade associations representing those companies. Trade associations involved include the Edison Electric Institute, the Powerline Communications Association (PLCA), the PLC Forum, United Power Line Council (UPLC), and the United Telecom Council (UTC).[11] These groups have a financial stake in bringing BPL successfully to market and are eager to enter the broadband business.

Amateur radio users have expressed opposition to BPL deployment because of concerns over its potential negative impact — specifically, interference — on amateur radio frequencies by BPL emissions. Although some of its concerns had been addressed in the BPL Report and Order, the ARRL remained concerned about the impact of widespread deployment of these systems.[12]

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[10] "The first wave of BPL roll-outs doesn't pose much of a threat to the Comcasts and Verizons of the industry, which boast millions of customers and have been selling high-speed access since the late '90s. Some 22 million U.S. households already subscribe to a broadband service, according to Forrester Research analyst Jed Kolko, making it one of the biggest hits of the digital age." Maryanne Murray Buechner, "Power Play: Electric grids May Become the Next Providers of Broadband Internet Access," *Time*, May 3, 2004. Available online at [http://www.time.com/time/insidebiz/article/0,9171,1101040503-629395,00.html].

[11] Website addresses for these groups are listed at the end of this report.

[12] Amateur Radio Relay League, "FCC Acknowledges Interference Potential of BPL as it Okays Rules to Deploy It." October 14, 2004. Available online at [http://www.arrl.org/news/stories/2004/10/14/1/?nc=1].

In addition to the abovementioned groups, several government entities have an interest in how BPL is deployed. Specifically, local and regional emergency responders, the Department of Defense, the Federal Emergency Management Agency (now part of the Department of Homeland Security), and the National Telecommunications and Information Administration (NTIA) within the Department of Commerce have expressed both concern and support for BPL. Although these groups express concerns similar to those of ARRL — namely that BPL could potentially interfere with emergency communications and steps need to be taken to ensure noninterference — they also express support for BPL because they believe it will contribute to a more secure and better-managed electric transmission and distribution network.[13] The NTIA expresses support for BPL because of its potential to further close the "digital divide,"[14] one of its major goals. Further, because of the services that can be offered over BPL (e.g., voice over Internet Protocol [VoIP]), the law enforcement community is also concerned about the regulatory treatment of BPL — specifically, whether BPL services should be subject to federal wiretap requirements set forth in the Communications Assistance for Law Enforcement Act (CALEA).

The FCC has the largest role in how BPL will be deployed. It not only is the regulatory agency that developed the rules governing BPL, it also has a statutory obligation under Section 706 of the Telecommunications Act of 1996 to "encourage the deployment on a reasonable and timely basis of advanced telecommunications capability to all Americans."[15] The FCC, therefore, will maintain a significant influence on how the market for BPL service develops.

Recent Activity

In May 2007, the ARRL filed a federal appeals court brief requesting oral arguments in its petition for review of the FCC's BPL rules. The ARRL petitioned the U.S. Court of Appeals for the DC Circuit to review the FCC's October 2004 R&O and 2006 MO&O. In its brief, the ARRL contends, among other things, that the FCC's actions in adopting rules to govern unlicensed BPL systems fundamentally alter the longstanding rights of radio spectrum licensees, including amateur radio operators.[16] Reply briefs were filed in July 2007.[17]

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[13] See *supra* note 5.

[14] The "digital divide" refers to the "gap between those who can effectively use new information and communication tools, such as the Internet, and those who cannot." While a consensus does not exist on the extent of the divide (and whether the divide is growing or narrowing), there is general agreement that some degree of divide exists. The Digital Divide Network, *Digital Divide Basics*. Available online at [http://www.digitaldivide.net/articles/view.php?ArticleID=208].

[15] See Section 706 of the Telecommunications Act of 1996, P.L. 104-104, 110 Stat. 56 (1996).

[16] ARRL News Release, "ARRL Files Federal Appeals Court Brief in Petition for Review of BPL Rules," May 24, 2007. Available online at [http://www.arrl.org/news/stories/2007/

(continued...)

In August 2007, the House of Representatives passed H.R. 3221, the New Direction for Energy Independence, National Security, and Consumer Protection Act. If signed into law, Section 9113(a)(8) would require an assessment by a newly established Grid Modernization Commission to determine, biannually, the progress being made toward modernizing the electric system, including an "assessment of ancillary benefits to other economic sectors or activities beyond the electricity sector, such as potential broadband service over power lines."

Federal Communications Commission Activity

The FCC has been investigating BPL since 2003 and adopted rules regulating BPL systems in October 2004; it is also addressing BPL-related issues in its CALEA and IP-Enabled Services Proceedings.

Broadband over Powerline Systems Proceeding

In April 2003, the FCC issued a Notice of Inquiry (NOI),[18] *Inquiry Regarding Carrier Current Systems, including Broadband over Powerline Systems*,[19] to gather comments concerning whether it should amend its Part 15 Rules[20] "to facilitate the deployment of Access BPL while ensuring that licensed services continue to be protected."[21] The FCC received over five thousand initial and reply comments in response to its NOI during July and August 2003. These comments were discussed at length in the FCC's February 2004 Notice of Proposed Rulemaking (NPRM).[22]

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[16] (...continued)
05/24/100/?nc=1].

[17] The FCC's response to ARRL's initial filing is online at [http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-274854A1.pdf]. ARRL's reply brief is online at [http://www.arrl.org/tis/info/HTML/plc/Court_Appeal_ReplyBrief2007july31.pdf].

[18] A Notice of Inquiry "is the earliest step in the FCC's process and typically asks questions in an effort to gather enough information to make informed proposals on a given topic." A Notice of Proposed Rulemaking is "a request for comment on specific proposals made by the Commission. After the FCC reviews the comments filed in response to an NPRM, it can issue a Report and Order adopting new rules." FCC Fact Sheet, available online at [http://www.fcc.gov/Bureaus/ Common_Carrier/Factsheets/ispfact.html].

[19] Federal Communications Commission, *Inquiry Regarding Carrier Current Systems, including Broadband over Powerline Systems*, Notice of Inquiry, ET Docket 03-104, FCC 03-100. This document is available online at [http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-03-100A1.pdf].

[20] 47 C.F.R. Section 15. The FCC's Part 15 Rules are discussed on page 9 of this report.

[21] NOI, para. 2.

[22] Federal Communications Commission, *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*, ET Dockets 04-37 and 03-104, Report and Order, FCC 04-29, adopted February 12, 2004, (continued...)

The FCC adopted its Report and Order (R&O or "Order") in this proceeding in October 2004.[23] Specifically, the Order —

- set forth rules imposing new technical requirements on BPL devices, such as the capability to avoid using any specific frequency and to remotely adjust or shut down any unit;
- established "excluded frequency bands" within which BPL must avoid operating entirely to protect aeronautical and aircraft receivers communications; and establishes "exclusion zones" in locations close to sensitive operations, such as coast guard or radio astronomy stations, within which BPL must avoid operating on certain frequencies;
- established consultation requirements with public safety agencies, federal government sensitive stations, and aeronautical stations;
- established a publicly available BPL notification database to facilitate an organized approach to identification and resolution of harmful interference ;[24]
- changed the equipment authorization for BPL systems from verification to certification;[25] and
- improved measurement procedures for all equipment that use RF energy to communicate over power lines.

After the Order was released, the amateur radio community and the BPL industry filed a total of 17 petitions for reconsideration. The FCC released a Public Notice on February 28, 2005, announcing the petitions. Oppositions to petitions were due on March 23, 2005, and replies to the oppositions were due April 4, 2005.

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[22] (...continued)
released February 23, 2004. Available online at [http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-04-29A1.pdf].

[23] Federal Communications Commission, *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*, ET Dockets 04-37 and 03-104, Report and Order, FCC 04-245, adopted October 14, 2004, released October 28, 2004. This document is available online at [http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-04-245A1.pdf].

[24] The database is in operation. FCC Office of Engineering and Technology, Public Notice, ET Docket No. 04-37, announced that the United Telecom Council would serve as the Access BPL database manager. Access BPL systems were required to comply with the requirements of Section 15.615 by November 19, 2005. The Public Notice is available online at [http://hraunfoss.fcc.gov/edocs_public/attachmatch/DA-05-2701A1.pdf].

[25] Verification is a self-approval process; certification involves an approved third party. See [http://ftp.fcc.gov/oet/ea/procedures.html] for specific information.

On August 3, 2006, the FCC adopted a Memorandum Opinion and Order (MO&O) in this matter.[26] Specifically, the MO&O —

- affirmed its rules regarding emission limits for BPL, including its determination that the reduction of emissions to 20 dB below the normal Part 15 emissions limits will constitute adequate interference protection for mobile operations;
- denied the request by the amateur radio community to prohibit BPL operations pending further study and to exclude BPL from frequencies used for amateur radio operations;
- denied the request by the television industry to exclude BPL from frequencies above 50 MHz;
- affirmed the July 7, 2006 deadline for requiring certification for any equipment manufactured, imported or installed on BPL systems, with the proviso that uncertified equipment already in inventory can be used for replacing defective units or to supplement equipment on existing systems for one year within areas already in operation;
- affirmed the requirement that information regarding BPL deployment must be provided in a public database at least 30 days prior to the deployment of that equipment;
- adopted changes regarding protection of radio astronomy stations by requiring a new exclusion zone and amending consultation requirements for these stations;
- adopted changes to provide for continuing protection for aeronautical stations that are relocated
- denied the request by the aeronautical industry to exclude BPL operating on low-voltage lines from frequencies reserved for certain aeronautical operations; and
- denied the request by the gas and petroleum industry to be considered as public safety entities.

On October 10, 2006, the ARRL notified the U.S. Court of Appeals for the D.C. Circuit that it is appealing certain aspects of both the FCC's October 2004 R&O and August 2006 MO&O.

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[26] Federal Communications Commission, *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*, ET Dockets 04-37 and 03-104, Report and Order, FCC 06-113, adopted August 6, 2004, released August 7, 2006. Available online at [http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-06-113A1.pdf].

Concurrent to this other activity, in December 2005, the UPLC filed a petition for declaratory ruling requesting that the FCC find that BPL-enabled Internet access service is an information service, rather than a telecommunications service. In response, in October 2006, the FCC issued an MO&O affirming the UPLC's petition, which placed BPL-enabled Internet access service on an equal regulatory footing with other broadband services, such as cable modem service and DSL Internet access service.[27]

Communications Assistance for Law Enforcement Act Proceeding

On August 5, 2005, the FCC ruled that providers of certain broadband and interconnected VoIP services must accommodate law enforcement wiretaps.[28] Such a definition includes the type of service that would be provided via BPL. The FCC found that these services can be considered replacements for conventional telecommunications services currently subject to wiretap rules, including circuit-switched voice service and dial-up Internet access. As such, the new services are covered by CALEA, which requires the FCC to preserve the ability of law enforcement to conduct wiretaps as technology evolves. The rules are limited to facilities-based broadband Internet access service providers and VoIP providers that offer services permitting users to receive calls from, and place calls to, the public switched telephone network.[29]

IP-Enabled Services Proceeding

On March 10, 2004, the FCC released an NPRM, *In the Matter of IP-Enabled Services*.[30] This rulemaking, still under consideration at the FCC, will likely affect BPL in that it will determine how the services that will be offered via BPL will be regulated. Comments and replies to the NPRM were due May 28 and June 28, 2004, respectively. On June 3, 2005, the FCC released an order on Enhanced 911 services over IP-enabled services.[31] In this order, the Commission adopted rules requiring

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[27] Federal Communications Commission, *In the Matter of United Power Line Council's Petition for Declaratory Ruling Regarding the Classification of Broadband over Power Line Internet Access Service as an Information Service*, WC Docket 06-10, Memorandum Opinion and Order, FCC 06-165, adopted November 3, 2006, released November 7, 2006. Available online at [http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-06-165A1.pdf].

[28] The R&O is available online at [http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-05-153A1.pdf]. Although the FCC adopted this rule on August 5, 2005, the Report and Order was not officially released until September 23, 2005.

[29] For additional information about the CALEA proceeding, see *Digital Surveillance: The Communications Assistance for Law Enforcement Act*, by Patricia Moloney Figliola.

[30] *In the Matter of IP-Enabled Services, Notice of Proposed Rulemaking*, FCC 04-28, WC Docket 04-36, adopted February 12, 2004, released March 10, 2004. Available online at [http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-04-28A1.pdf].

[31] *In the Matter of IP-Enabled Services and E911 Requirements for IP-Enabled Service Providers, First Report and Order and Notice of Proposed Rulemaking*, WC Dockets 04-36

(continued...)

providers of interconnected voice over Internet Protocol (VoIP) service to supply enhanced 911 (E911) capabilities to their customers. The characteristics of interconnected VoIP services have posed challenges for 911/E911, and threaten to compromise public safety. Thus, the FCC required providers of interconnected VoIP service to provide E911 services to all of their customers as a standard feature of the service, rather than as an optional enhancement. The Commission further required them to provide E911 from wherever the customer is using the service, whether at home or away from home. The FCC had no findings regarding whether a VoIP service that is interconnected with the public switched telephone network should be classified as a telecommunications service or an information service.

Wireless Broadband Task Force Report

On March 8, 2005, the FCC's Wireless Broadband Access Task Force released its report to the Commission containing its findings and recommendations.[32] The report highlights how some BPL providers are using Wi-Fi (i.e., wireless networking) to complement their service offerings, either employing Wi-Fi access points within the BPL network to transmit information from one power line to another or to use wireless networking technologies to reach from utility poles to individual homes. Comments to the report were due April 22, 2005, and replies were due May 23, 2005. No further action has been taken at this time.

National Telecommunications and Information Administration Activity

In April 2004, the NTIA released Phase 1 of a study on the potential for BPL to interfere with radio frequencies used by Government users for homeland security, defense, and emergency response.[33] In that report, initiated by NTIA in response to the FCC's NOI, the NTIA described federal government usage of the 1.7-80 MHz spectrum, identified associated interference concerns, and outlined the studies it

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[31] (...continued)
and 05-196, FCC 05-116, adopted May 19, 2005, released June 3, 2005. Available online at [http://www.askcalea.net/archives/docs/20050603_fcc-05-116.pdf].

[32] See GN Docket 04-163. The report was written by FCC staff and was not voted on or approved by the Commission. Therefore, neither the report nor any of its recommendations necessarily reflect the views of the FCC. Available online at [http://www.fcc.gov/wbatf].

[33] See *supra* note 6. Phase 2 of NTIA's study will evaluate the effectiveness of its Phase 1 recommendations and address potential interference via ionospheric propagation of BPL emissions from mature large-scale deployments of BPL networks. The ARRL requested that the FCC extend the NPRM comment deadline until June 13, 2004 (the deadline is currently June 1, 2004) to accommodate the delayed release of this report. The ARRL stated it would like to have 60 days to review the NTIA study prior to submitting comments. The FCC denied the request. See *Carrier Current Systems, including Broadband over Power Line Systems* (ET Docket 03-104) *and Amendment of Part 15 Regarding New Requirements and Measurement Guidelines for Access Broadband over Power Line Systems*, ET Docket 04-37, Order Denying Extension of Time, DA 04- 1175, April 30, 2004. Phase II of the report is expected sometime late 2005 or early 2006.

planned to conduct to address those concerns. The report (1) contains findings on interference risks to radio reception in the immediate vicinity of overhead power lines used by BPL systems (Access BPL only); (2) suggests means for reducing these risks, and (3) identifies techniques for mitigating interference should it occur.[34]

One of the most important findings of the report was that existing Part 15 compliance measurement procedures for BPL tended to significantly underestimate BPL peak field strength.[35] Such underestimation increases the risk of interference. According the report, as currently applied to BPL systems, Part 15 measurement guidelines do not address the unique characteristics of BPL emissions. Overall, the report concludes that BPL could interfere with licensed radio spectrum, even though under the current Part 15 testing parameters, emission levels would be within the limits. Therefore, it was recommended that the compliance measurement procedures be refined.

The NTIA stated, however, that refining the compliance measurement procedures should not impede deployment of BPL because the technology can reportedly be deployed within a more narrow range of frequencies that will not cause interference.[36] For these reasons, the NTIA did not recommend that the FCC relax Part 15 field strength limits for BPL systems. Instead, NTIA recommended new measurement provisions derived from existing guidelines, including using measurement antenna heights near the height of power lines; measuring at a uniform distance of 10 meters from the BPL device and power lines; and measuring using a calibrated rod antenna or a loop antenna in connection with appropriate factors relating magnetic and electric field strength levels at frequencies below 30 MHz.[37]

Overall, NTIA supported the continued development and deployment of BPL and suggested several means by which BPL interference could be prevented or eliminated. For example, mandatory registration of certain aspects of BPL systems would give radio operators the information needed to advise BPL operators of any anticipated interference problems or suspected actual interference. NTIA also recommended that BPL developers consider, for example, routinely using the minimum output power needed from each BPL device; avoiding locally used radio frequencies; using filters and terminations to extinguish BPL signals on power lines where they are not needed; and carefully selecting BPL signal frequencies to decrease radiation.[38]

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[34] NTIA Report, pp. 5-7.

[35] The FCC's Part 15 Rules govern the operation of unlicenced radiofrequency devices, for example, cordless phones, computers, wireless baby monitors, and garage door openers. As a general condition of operation, Part 15 devices may not cause harmful interference to authorized radio services and must accept any interference that they receive. The Part 15 rules have allowed the development of new unlicenced devices while protecting authorized users of the radio spectrum from harmful interference. 47 C.F.R. Section 15.

[36] NTIA Report, pp. 5-7.

[37] Ibid.

[38] Ibid.

Issues for Congress

Issues potentially of interest to Congress may be divided into three categories.

- Industry and societal issues, such as the impact of BPL on competition in broadband services, and the potential for BPL to reach previously unserved and underserved populations.

- Larger regulatory and industry governance issues, such as how the regulatory classification of BPL might affect other FCC regulations and proceedings (e.g., the appropriate regulatory classification of IP-based services) and electric utility regulations (e.g., reliability mandates, Federal Energy Regulatory Commission (FERC) regulations, and Public Utility Holding Company Act (PUHCA) exemptions).[39]

- Technical issues, such as how BPL should be implemented to minimize interference with other services (e.g., amateur radio frequencies) and what effect BPL technology may have on reliability and security of the transmission and distribution systems and homeland security goals (i.e., BPL may result in benefits as well as risks).

Each issue is discussed below.

Industry Competition and Societal Issues

Since the passage of the 1996 Telecommunications Act, Congress has sought to increase both competition between broadband service providers, as well as the availability and adoption of broadband services.[40] Although the current competitive environment for broadband service could be considered fairly robust, with significant competition between cable and DSL providers, both policymakers and consumers alike would likely welcome a third wide-spread, facilities-based option for receiving that service (satellite broadband service is not widely available as it usually requires a dial-up "uplink" to the Internet). BPL could provide that opportunity for the "third wire" to the home.

While further increasing consumer choice is a goal of both Congress and the FCC, there are still consumers who have no options or perhaps only one option for

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[39] Although electric utility entry into telecommunications is addressed in the 1996 Act, issues dealing primarily with electric utility regulation are beyond the scope of this report. For more information on those issues, see CRS Report RL32728, *Electric Utility Regulatory Reform: Issues for the 109th Congress*, by Amy Abel.

[40] As mentioned above, the FCC has a mandate under Section 706 of the 1996 Act to promote broadband deployment.

receiving broadband service.[41] Some of those consumers are likely part of those populations that are traditionally underserved, (e.g., rural residents, low-income consumers) and for them, BPL may also provide at least a partial solution. BPL, not being limited, technically, by distance and not requiring upgrades to the electric lines themselves, is significantly easier to deploy to what might be considered by cable and DSL providers to be "undesirable" areas. Of course, cost and potential profitability are still issues in those areas and there will always be areas where deployment is simply not realistic either technologically or economically, or both.

Congress may wish to continue monitoring how the FCC balances ensuring that BPL, as a new technology, is given every opportunity to reach the market, while also ensuring that it is not given an unfair regulatory advantage over other similar services. In the coming months, the electric utilities will roll out their commercial BPL offerings. As electric utilities deploy their commercial systems, the FCC's role in ensuring that the utilities are given incentives for wide BPL deployment, while also considering additional policy questions that arise, will be watched to assess the success of both the FCC and of BPL.

Regulatory and Industry-Governance Issues

Broadband over powerlines is just the latest in a growing list of technologies and services that challenge the current structure of the FCC and the statutory and regulatory "stove pipes" required by current law. While BPL is a technology for the delivery of Internet service, it challenges traditional and embedded thinking and paradigms about telecommunications and information services because it does not fit neatly into an existing category of service. If Congress decides to amend the

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[41] According to a Pew Internet Project report issued in April 2004, "Availability can figure into broadband adoption in two ways. First, the physical infrastructure to provide broadband is an obvious prerequisite to having service. Second, the availability of multiple providers may matter, as the existence of some competition in the market may be conducive to adoption among consumers.

> "With respect to broadband infrastructure, 77% of Americans say they live in an area in which broadband is available, 8% said they do not live in an area where broadband is available, and 15% say they do not know. This compares with 71% of Americans who said in October 2002 that broadband is available where they live, 12% who said it was not available, and 17% who did not know. Of those who live in a place where they say broadband is not available, 54% say they would like to get it, higher than the 40% average for dial-up users.
>
> When asked whether there is more than one broadband provider in their area, 61% of those who have broadband or know it is available said multiple providers serve their area. One in six (17%) said one provider serves their area and 22% did not know. Broadband users who lived in areas with multiple service providers said they paid $38.50 per month for service, while those who said they had one option for service paid an average of $42.80 per month.

Pew Internet Project, *Broadband Penetration on the Upswing: 55% of Adult Internet Users Have Broadband at Home or Work*, April 19, 2004. Available online at [http://www.pewinternet.org/PPF/r/121/report_display.asp].

country's current communications laws, it may consider the impact that such new technologies are having on the way lawmakers and regulators have traditionally looked at underlying transmission technologies.[42]

With respect to IP-enabled services that would be provided over BPL, the one with the most legal and regulatory impact may be IP-based voice service (voice over Internet Protocol or VoIP). VoIP is different from traditional telephone service in that it does not employ a single, dedicated path between the calling parties (called circuit switching). Instead, VoIP "translates" analog voice into digital "packets" and transmits those packets along multiple paths (called packet switching) and reassembles the packets at the receiving end.[43] This is the same format, or protocol, used to transmit email, instant messages, video, and other data via the Internet. Thus, voice is no longer a separate service — voice data looks just like every other kind of data.

Until recently, VoIP has been provided by companies that are in one way or another "communications providers," whether that be voice, data, or video communication. However, electricity companies have not generally been in the business of providing resale communications. This blurring of lines between voice and other types of data has already raised issues such as law enforcement's ability to conduct wiretaps and state versus federal jurisdiction over such calls (discussed earlier in this report); intercarrier compensation for call termination on the public switched network; and universal service. These issues will likely become even more complex with the entry of electric utilities into the communications business since they will be offering IP-enabled services, both directly to the consumer as well as to third-party vendors (i.e., Internet service providers). As the market develops a tension may develop over whether these new entrants should be required to adhere to existing requirements, or perhaps how existing requirements should be changed to better reflect the current technological and competitive environment.

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[42] During April and May 2004, the Senate and the House held four hearings on issues related to the implementation of the Telecommunications Act of 1996. The Senate Committee on Commerce, Science, and Transportation has held three hearings on the Telecommunications Act of 1996 and related issues: *Telecommunications Policy Review: Lessons Learned from the Telecom Act of 1996* (April 27, 2004), *Telecommunications Policy: A Look Ahead* (April 28, 2004), and *Telecommunications Policy Review: A View from Industry* (May 12, 2004). The Chairman's remarks and witness statements are available online at [http://commerce.senate.gov]. The House Subcommittee on Telecommunications and the Internet of the Committee on Energy and Commerce held one hearing on this issue on May 19, 2004, *Competition in the Communications Marketplace: How Convergence Is Blurring the Lines Between Voice, Video, and Data Services*. These hearings were viewed as informational, fact-finding efforts to set the groundwork for a reexamination of the 1996 Act during the 109th Congress.

[43] The packets, once delivered, may be converted back into an analog signal or left in digital form depending on the receiving party's terminal equipment (i.e, a telephone, a computer, etc.).

Technical Issues

The FCC focused on technical issues in its BPL proceedings. These issues have included how BPL should be implemented to minimize interference with other services (e.g., amateur radio frequencies) and what effect BPL technology could have on reliability and security of the transmission and distribution systems (i.e., BPL may provide benefits as well as potentially create risks). Although the FCC's regulations mandate the technical standards under which BPL will be deployed, those standards will very likely have an impact on the previous two categories of issues and, therefore, Congress may have an interest in monitoring the development of these technical issues as well.

Interference with Other Licensed Services. Some stakeholders have continued to express varying degrees of concern over the potential of BPL to disrupt licensed radio services, including amateur, public safety, and emergency response frequencies.[44] The FCC continues to address those concerns in its BPL proceedings.

Service Reliability and Security Issues. Other stakeholders stated during the proceeding that BPL upgrades by the electric utilities have the potential to enhance the security and reliability of the transmission and distribution networks. For example, BPL technology can provide electricity outage detection, home energy management, distribution transformer overload analysis, demand side management, supervisory control and data acquisition (SCADA) data transmission, safety checks for isolated circuits, power quality monitoring, phase loss detection, line testing, and outage localization, among other things.[45] However, while the first four functions simply provide additional operational monitoring and control abilities, the fact that enhanced data may be supplied to the SCADA system via BPL could be of concern to electric utility companies and homeland/infrastructure security officials. The FCC did not address this issue in its rulemaking proceeding. However, some parties that did not participate in the rulemaking have expressed concern that BPL would make the transmission and distribution system vulnerable to individuals or groups trying

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[44] NPRM, paragraphs 14-26. Commenters included the American Radio Relay League, the National Telecommunications and Information Administration, the National Research Council (through its Committee on Radio Frequencies, or CORF), the North American Short Wave Radio Association, the Association of Public Safety Communications Officials, and the Federal Emergency Management Agency.

[45] NOI, Comments of PPL Telecom, LLC, Section IV. Available online at [http://www.neca.org/wawatch/wwpdf/070803_40.pdf]. SCADA systems provide the command and control functions for some critical infrastructures such as the electric, telecommunications, gas, and nuclear industries. SCADA is "a computer system for gathering and analyzing real time data. A SCADA system gathers information, such as where a leak on a pipeline has occurred, transfers the information back to a central site, alerting the home station that the leak has occurred, carrying out necessary analysis and control, such as determining if the leak is critical, and displaying the information in a logical and organized fashion. SCADA systems can be relatively simple, such as one that monitors environmental conditions of a small office building, or incredibly complex, such as a system that monitors all the activity in a nuclear power plant or the activity of a municipal water system." Webopedia: Online Computer Directory for Computer and Internet Terms and Definitions, [http://www.webopedia.com/TERM/S/SCADA.html].

to steal or corrupt consumers' Internet data or the utilities' monitoring data, or even to terrorists trying to cause a large-scale disruption of the nation's electricity supply.[46] If sensitive operational information, as well as consumers' personal data, is being sent over the lines the physical security of those lines and the integrity of the data on them become a serious concern. Although BPL may offer significant social and competitive benefits, the possible negative impact that BPL may have on reliability and security may be a more important factor in BPL deployment.

Congressional Action: 110th Congress

In January 2007, Representative Mike Ross introduced H.R. 462, the Emergency Amateur Radio Interference Protection Act.[47] This bill would require that within 90 days after the date of enactment, the FCC would be required to conduct "a study of the interference potential of systems for the transmission of broadband Internet services over power lines." The study would examine —

- the variation of field strength of BPL service signals with distance from overhead power lines, and a technical justification for the use of any particular distance extrapolation factor;
- the depth of adaptive, or `notch', filtering for attenuating normally permitted BPL service radiated emission levels that would be necessary and sufficient to protect the reliability of mobile radio communications;
- a technical justification for the permitted, radiated emission levels of BPL signals relative to ambient levels of man-made noise from other sources; and
- options for new or improved rules related to the transmission of BPL service that, if implemented, may prevent harmful interference to public safety and other radio communications systems.

Upon completion, the FCC would be required to submit the study report to the House Committee on Energy and Commerce and the Senate Committee on Commerce, Science, and Transportation. This bill was referred to the House Committee on Energy and Commerce. No further action has been taken.

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[46] For an article and discussion highlighting these concerns, see David Coursey, *Why Broadband over Powerlines is a Bad Idea*, ZDNet, February 27, 2004. Available online at [http://reviews-zdnet.com.com/4520-7298_16-5123406.html]. See especially [http://reviews-zdnet.com.com/5208-6118-0.html?forumID=1&threadID=322&messageID=8603&start=151] for a discussion of alleged BPL vulnerabilities.

[47] This bill is similar in nature to H.Res. 230 and amendment #25 to H.R. 5252, the Communications Opportunity, Promotion, and Enhancement Act of 2006, also introduced by Representative Ross.

On August 4, 2007, the House of Representatives passed H.R. 3221, the New Direction for Energy Independence, National Security, and Consumer Protection Act. If signed into law, Section 9113(a)(8) would require an assessment by a newly established Grid Modernization Commission to determine, biannually, the progress being made toward modernizing the electric system, including an "assessment of ancillary benefits to other economic sectors or activities beyond the electricity sector, such as potential broadband service over power lines."

For Additional Reading

CRS Products

CRS Report RL33542, *Broadband Internet Regulation and Access: Background and Issues*, by Angele A. Gilroy and Lennard G. Kruger.

CRS Report RL32728, *Electric Utility Regulatory Reform: Issues for the 109th Congress*, by Amy Abel.

Websites

American Public Power Association, [http://www.appanet.org]

American Radio Relay League, [http://www.arrl.org]

Edison Electric Institute, [http://www.eei.org]

Federal Communications Commission, [http://www.fcc.gov/]

- FCC NOI: [http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-03-100A1.pdf]
- FCC NPRM: [http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-04-29A1.pdf]

National Telecommunications and Information Administration, [http://www.ntia.doc.gov/]

- NTIA BPL Report: [http://www.ntia.doc.gov/ntiahome /fccfilings/2004/ bpl/index.html]

PLC Forum, [http://www.plcforum.org]

United Power Line Council, [http://www.uplc.org]

United Telecom Council, [http://www.utc.org]

Other Reports and Documents

"Broadband Over Powerlines," Angel M. Cartagena, Jr., *Electric Perspectives*, March/April 2004, [http://www.eei.org/magazine/editorial_content/nonav_stories/2004-03-01-Broadband.htm].

"The Final Connection," Brett Kilbourne, *Electric Perspectives*, July/August 2001, [http://www.eei.org/magazine/editorial_content/nonav_stories/2001-07-01-connection.htm].

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"Providing Ubiquitous Gigabit Networks in the United States," IEEE-USA Committee on Communications and Information Policy, March 2005, [http://www.ieeeusa.org/volunteers/committees/ccip/docs/Gigabit-WP.pdf].

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