

Progress Energy reaches out to hams on BPL

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Amateur Radio operators are seriously worried about BPL – Broadband Internet over Power Lines – and the interference potential it holds for High Frequency (and low VHF) operation. In the southeast, Raleigh NC based Progress Energy (formerly CP&L) has responded to many calls and e-mails from concerned hams by contacting several local Amateur leaders and beginning a dialog that will include Amateur Radio in their BPL testing.

In October, Progress Energy network engineer Bill Godwin met separately with Wake County ARES EC Tom Brown, N4TAB, and me, and talked by phone with Technical Specialist Frank Lynch, W4FAL. The meetings were friendly. Godwin wanted to know more about Amateur Radio, what we thought our problems with BPL might be, and who in the Amateur community he and Progress Energy should work with. They are hearing from a lot of us, and needed to define a point of contact. In addition to those above, we identified North Carolina Section Manager John Covington, W4CC, and ARRL Lab Supervisor Ed Hare, W1RFI, as a core group for Progress Energy to work with. Godwin set a positive tone by promising that we would be part of the next phase of testing, to begin early in 2004 in Wake County, NC.

Tom Brown N4TAB had the initial meeting with Godwin (and Chris Funari, another Progress Energy engineer). He said that they both had a basic understanding of the interference potential that BPL might cause to Amateur Radio. They discussed some of the regulations that BPL operates under (see the **BPL Primer** article following this one), and the makeup of the Amateur Radio community. Brown introduced some ideas that Godwin and Funari hadn't considered yet, like the possibility of interference from hams *to* the BPL system in the ham's neighborhood. Mostly, though, it was an initial meeting designed mostly for the people to get to know each other.

When I met with Bill Godwin two weeks later, we talked a little more about how BPL might affect Amateur Radio. I gave him a brief overview of the spectrum that BPL covers, noting that it is literally the *entire* spectrum available for worldwide ionospheric propagation. I showed him where Amateur Radio bands fit in that spectrum. And we tuned the bands a little.

We looked at the bottom of my cordless phone, and read the Part 15 language about how unlicensed devices “may not cause harmful interference” to licensed services. Then I tuned in some weak signals on 20 meters, and I asked what “harmful interference” would be: making the signals slightly harder to hear? Difficult to hear? Impossible to hear? It was a good example of the difference between “meeting specs” and the real world. BPL hardware vendors say their systems “meet specs.” But they don't warn customers (like Progress Energy) about what real interference their systems can cause.

Godwin asked about notch filters. I explained that notching the ham spectrum might work in a limited sense, but it wouldn't protect other services like shortwave broadcast listeners, aviation, etc. And it wouldn't protect bands that ham radio might get in the future. I mentioned the example of the “HomePlug” system that uses home power lines as a local network. HomePlug is a form of BPL that radiates RF across the HF spectrum, and initial units caused considerable interference in the home where the device was installed, and in neighboring homes. The company worked with the ARRL to develop reasonably effective notches that limit interference in the ham bands, but that was before our new allocation at 5 MHz. HomePlug continues to interfere with 5 MHz reception and other shortwave reception.

Phase I and II

Progress Energy completed their Phase I test in the Wakefield area of north Raleigh early last summer. Phase I was designed to give their engineers experience with the hardware, and let them know if it really worked. From their perspective, it worked well - computer users got better than expected connection speeds. Amateur Radio was not involved in that test, and no Amateur Radio interference monitoring was conducted. But they have been hearing from hams steadily, and stridently, ever since.

Phase II is planned for the end of the year and early 2004. It will be a larger test, somewhere in southern Wake County, though the location wasn't final as of this writing in early November. The test will focus more on marketing than technology, but hams will be invited to participate, and their interest will be technical.

Both Phase I and II tests involve mostly underground wiring. ARRL Lab Supervisor Ed Hare's testing in areas with underground wiring showed that substantial interference still occurred, though above ground wiring was worse. Progress Energy is testing a system manufactured by Amperion. None of the four trial systems that Ed Hare observed initially were using Amperion equipment, but he has since visited one Amperion test site, and noted strong interference. Amperion uses the same core hardware as another BPL equipment provider, Ambient, that was part of the original test. Hare's test of an Ambient system showed very serious interference.

In late October, the town of Manassas, Virginia, announced the full commercial rollout of their BPL system, making it the first to move from trial to the market. The town owns the power system, and is subcontracting the operation of the BPL Internet distribution. The ARRL has warned the town government that interference to Amateur Radio operation is contrary to Part 15 regulation, and will not be tolerated.

Amateurs in the territory served by Progress Energy now have a cordial, official relationship with the company. But even with a friendly start, what might happen in the future is not clear. The ARRL considers BPL to be a fatally flawed technology that is not needed in the marketplace. Progress Energy has not committed to a BPL rollout, but if their management determines that it will be a profitable product, we can expect them to want to implement it. If tests show that interference to the radio spectrum (and Amateur Radio) is the only significant problem, the company is not promising to abandon the product.

Contact Progress Energy?

Should hams stop contacting Progress Energy with questions and comments about BPL? No, not at all. The company needs to know that the concern is widespread. However, if you have a question or comment about Amateur Radio participation in testing BPL with Progress Energy, you should contact Tom Brown N4TAB (n4tab@arrl.net) and Frank Lynch W4FAL (w4fal@sera.org). If you have a press or public relations oriented comment, contact me (kn4aq@arrl.net). And for lots more information about BPL and Amateur Radio, visit the ARRL web site:

www.arrl.org/tis/info/HTML/plc/

A BPL PRIMER for Amateur Radio Operators

BPL – Broadband over Power Lines – became big news this year as the FCC appeared to embrace the technology that uses neighborhood power lines to distribute high-speed Internet to homes and businesses. Currently being tested in very limited areas (but in full rollout in Manassas, Virginia next year), BPL provides a third avenue of high-speed Internet delivery, and competition to cable TV and phone-line delivered DSL.

BPL is a local delivery system. The Internet data is not carried long distances on the high-tension lines. It is carried from the electric substation on the medium and low voltage lines that criss-cross neighborhoods, either above ground on poles, or buried underground. The system being tested by Progress Energy does not bring the Internet all the way into the home or business using the power lines, though. It uses 802.11-based “wi-fi” wireless to bridge the final few feet between nodes in each neighborhood and the user’s computer.

BPL is attractive to consumers. It provides Internet access at speeds similar to DSL and cable. It may be available in more places, or at lower cost, and the increased competition may drive cable and DSL prices down as well. Imagine being able to get high-speed Internet access from your own account just by plugging into any AC outlet in town, as promoted by the town of Manassas.

But the BPL technology has a flaw. To distribute Internet data, BPL puts RF energy on the power lines in the 2 to 80 MHz range. The power lines were never designed to carry RF. Unlike cable TV wiring, the power lines are unshielded, and act as antennas. The BPL signals on the power lines are low power – QRP, if you will – but the signals can be heard many feet from the power line. Ed Hare, W1RFI, the ARRL Lab Supervisor, set up a test vehicle and visited some of the BPL trial installations. His results are reported on the ARRL web site, where you can learn about BPL in depth, and download a short video that lets you see and hear what he observed. The web site is: www.arrl.org/tis/info/HTML/plc/.

Ed found that BPL doesn’t generate one big “wall of noise” across the entire spectrum. There are several different BPL systems, using different technology, and each has a different effect and sound on HF. Some sound like a series of closely spaced carriers. Some make clicking and chirping sounds like a Geiger counter. Sometimes it sounds like a phone ringing. The signals are distributed unevenly across the spectrum, but where they are present, they can cover tens to hundreds of kilohertz at a time. And they can be strong – S9 or better – even a few hundred feet from a power line. The more data being carried (because nearby computer users are downloading files or web pages), the more HF spectrum is used.

BPL is regulated by Part 15, the section of the FCC rules covering unlicensed devices. That includes both radios intended to put a signal on the air (cordless phones, baby monitors and the new 802-11 “wi-fi” wireless computer networks), and “unintentional radiators” (computers, microwave ovens, BPL) that don’t really want to be on the air, but can’t help letting a little RF escape. There are technical limits about how much RF can be radiated, and also a stipulation that the devices are not permitted to cause harmful interference to licensed services (including Amateur Radio), and receive no protection from interference they receive from licensed services.

The FCC has a **Notice of Inquiry (NOI)** pending that asks if any changes to Part 15 are needed to accommodate BPL. The notice doesn’t make specific recommendations about

changes. It just asks questions about how BPL might work, what problems it might cause, and how the rules might be changed to accommodate BPL, especially changes in signal measurement, since BPL defies the current test schemes. The NOI discusses the problem of interference to HF operation, and includes this paragraph of particular interest to hams:

18. Interference from BPL Emissions. In ... BPL technologies, multiple carriers spread signals over a broad range of frequencies that are used by other services that must be protected from interference. In the spectrum below 30 MHz, incumbent authorized operations include fixed, land mobile, aeronautical mobile, maritime mobile, radiolocation, broadcast radio, amateur radio terrestrial and satellite, and radioastronomy. In the spectrum from 30 to 300 MHz, incumbent authorized operations include fixed land mobile, aeronautical mobile, maritime mobile and mobile satellite, radioastronomy, amateur radio terrestrial and satellite, broadcasts TV and radio. This spectrum is also used for public safety and law enforcement, and Federal government aeronautical radionavigation, radionavigation satellite and radiolocation. Each of these authorized services in the spectrum must be protected from harmful interference.

The comment and reply comment period on this NOI expired last summer. The FCC received thousands of comments, the bulk of which came from hams asking that the systems be prohibited. Other HF spectrum users also protested.

BPL vendors and the power industry say that the systems being tested meet the Part 15 radiation limits. And they say that no tests have shown actual interference. In public comments to date, the power industry has carefully avoided any comment on the ARRL tests, although their reply comments to the NOI claim that the ARRL tests were flawed.

The ARRL position is that it's BPL that's flawed. BPL doesn't work without the risk of substantial interference to Amateur Radio and other HF spectrum users, and can't be made to work. Even if systems can be made to effectively notch the bands we use today, a widely deployed BPL infrastructure would effectively lock us *into* the current bands and *out of* any new HF bands, for two reasons: the notches wouldn't protect the new bands from interference, and they wouldn't protect the BPL system from interference *from us* on those bands.

And yes, hams could cause interference to their neighborhood BPL systems. The ARRL calculates that the BPL energy in the power wiring would be a few hundred milliwatts. An Amateur Radio signal from a legal-limit station, running a gain antenna, could induce several *watts* of energy in the line. So although the ham would be on one narrow spot frequency compared to the broadband BPL signal, the BPL amplifiers could be overloaded, producing artifacts that interfere across the BPL spectrum or even shutting the amplifier down completely. The effect: another reason for a neighbor to be unhappy with a neighborhood Amateur even though the Amateur is doing nothing wrong.

If all of this sounds like a "no-brainer" – that BPL just can't and won't be permitted to be built and enter the marketplace – then you haven't been paying attention. So far, the marketplace, and the regulatory system (the FCC) are ignoring complaints by Amateur Radio and other HF spectrum users. BPL is being promoted joyfully as the way to get high-speed Internet into more places than ever, at lower cost.

For more information on BPL, including the ARRL comments to the FCC, video of Ed Hare's mobile tests at some of the BPL trial sites, and links to a vast array of BPL information, visit this ARRL web site:

www.arrl.org/tis/info/HTML/plc/