

Dear Commissioners,

This letter is in response to NPRM 04-29 (ET Docket No. 03-104 and ET Docket No. 04-37), a notice of proposed rulemaking concerning access BPL systems. Let me first say that your desire to provide broadband connectivity to currently unserved/underserved communities is to be applauded. As an engineer in the telecommunications industry I know a bit about technology and am fortunate to have access to numerous broadband options (DSL, cable, fixed wireless, satellite, T1, etc.) in my area. Unfortunately, as a long time short wave listener, amateur radio operator, registered DSW (Disaster Services Worker) and engineer in the wireless telecommunications sector I must express my concern about Access BPL's great potential for wreaking havoc on the HF radio spectrum. I am also concerned that once again licensed users of the radio spectrum are being required to detect interference, file complaints about interference, and push for elimination of interference from unlicensed Part 15 devices which are being allowed to operate in licensed radio bands. I am concerned about the ensuing chaos and problems that will result from deployment of Access BPL technology (and any other similar Part 15 technology).

This letter was originally written in response to the NPRM 04-29 that was released by the FCC on February 23, 2004. That version of the NPRM was slightly different than the final version that was posted to the Federal Register on March 17, 2004. The Federal Register version of the NPRM was issued with different paragraph numbering, no footnotes, and some earlier text removed. I have modified my letter to reflect the paragraph numbers in the Federal Register version, BUT in several places I was forced to refer to footnotes and statements made in the Feb. 23 version. All paragraph numbers refer to the Federal Register version unless indicated otherwise.

The HF radio spectrum is extremely unique. Wireless communication is taking place all the way from DC to 60Ghz (and beyond). Assuming that the HF radio spectrum comprises the frequencies from DC to 30Mhz and that wireless communication is taking place all the way from DC to 60Ghz, then the HF radio spectrum is only 0.05% of the entire spectrum available. This 0.05% of the spectrum is the ONLY part of the entire radio spectrum with the unique capability to provide long-distance, worldwide communications without an infrastructure due to low atmospheric absorption and ionospheric propagation. This is the reason why the HF radio spectrum has been protected by international treaty: to make sure that this very unique and valuable radio spectrum is never polluted and is forever reserved for use by long-haul communication systems that would not be possible in any other part of the radio spectrum. The HF radio spectrum has been used for many decades by international shortwave broadcasters, amateur radio operators, governmental agencies, public service agencies, and others because (among other reasons) of its unique propagation characteristics. It is used by some public utilities as a "long haul backup" in the event of a system malfunction. For example, HF radio was used by a major local telephone company (I believe it was Pacific Bell) following the Northridge Earthquake several years ago to provide communications between California and the East Coast for several days until telephone service could be restored. Access BPL has a great potential for causing severe levels of harmful

interference to any and all of these services. It is very sad to me to see such a unique portion of the HF band being used as a “waste dump” for RF noise being generated by poorly designed and poorly filtered consumer electronics. It is sad to think that we as a country have worked so hard to protect natural resources such as our waterways, national parks, wetlands, etc. yet we are willing to trash this valuable radio spectrum just to provide another broadband alternative among many. It’s just not necessary. There ARE alternatives.

It had been my hope that during the NOI process, the Commission would have realized the potential for interference and would have dealt with it by delaying any deployment of BPL until it could be guaranteed that no harmful interference would be generated. The Commission sadly ignored the mounting evidence of BPL generated interference and chose to continue with deployment, but with some added regulations designed to mitigate interference if/when it occurs. At this point, licensed radio users that are concerned about interference issues can only help the FCC to craft new Part 15 regulations which can hopefully protect licensed users from the devastating impact of BPL generated noise.

It is my sincere hope that the FCC will not allow the HF radio spectrum to be permanently destroyed simply to provide yet another broadband option (among many). Access BPL (as currently implemented) is not the only way to provide service to underserved or unserved areas and to increase competition in the broadband market. There are numerous options including: satellite, fixed wireless, WiFi, WiMax, cellular, and even power line communications based upon microwave ISM frequencies far away from the sensitive HF radio bands (note Corridor Systems). It is my belief that Access BPL should only be deployed in radio bands that are already reserved for unlicensed devices (like the 2.4Ghz ISM band). It is also my belief that NOW is the time for the FCC to modify the Part 15 regulations to prevent further attempts to provide high speed communications by unlicensed devices in radio bands reserved for licensed radio users. It is my understanding (from reading the NPRM) that the FCC believes it is possible to deploy HF-based access BPL in a way that doesn’t harm existing licensed users. As an engineer and scientist I must strongly question this belief. In fact, ongoing trials in Raleigh, NC. prove that harmful interference from BPL exists. All “mitigation” attempts so far have resulted in somewhat less interference to amateur radio, but not elimination. A recent letter sent by Progress Energy to the FCC indicates that Progress Energy believes they have “done enough” to protect licensed users from interference, yet even Progress Energy acknowledges that after all of the modifications they’ve made to their system in response to amateur radio operator interference complaints their system still places enough RF energy into the 12 and 17 meter amateur radio bands and the upper portion of the 20 meter amateur radio band that it is easily detectable and thus harmful. Progress Energy’s e-mail is an attempt to re-define the term “harmful”. Essentially, Progress Energy has thrown their hands into the air and said: “We can’t do any better...so let’s re-define harmful so that we can claim to be in compliance”. This stance is deplorable, but not unexpected. It is interesting to note that this stance is a far cry from the BPL industry’s claims that their equipment operates at such low signal levels that they do not cause any interference. Obviously, those initial claims were far from the truth. In addition to this, nothing has been done to deal with other services (like

international shortwave listening or mobile public safety). The only service I'm aware of that Progress Energy attempted to deal with was amateur radio. This leaves international shortwave, public safety, and mobile/portable radio operators "out in the cold". It seems like a difficult (at best) proposition to try to deploy this technology without causing harmful interference to existing licensed users. It is my hope that my letter will help you to think clearly about the impact of this technology and to help you better understand the concerns of licensed users of the HF radio spectrum. It is my hope that in the end, should access BPL be allowed at all, that the FCC will strictly enforce the Part 15 regulations and not allow BPL (or any similar technology) to interfere with any licensed users of the radio spectrum. It is my hope that should BPL be allowed, that the FCC will continue to honor its promise to protect licensed users from interference caused by access BPL (and other Part 15 devices). If BPL can truly be deployed without interference, then licensed users will have no complaints about deployment. All that licensed users ask for is a commitment by the FCC to add very strict interference elimination requirements for access BPL devices and to enforce those regulations even when "big money" utilities don't like it.

I would like to propose the following changes to regulations concerning BPL systems:

- 1) The term "interference mitigation" should be changed to "interference elimination". The term "mitigation" implies a lessening of interference. Licensed users deserve to have all interference eliminated. The word "interference" implies a negative effect by one system on another. Obviously, spurious RF that doesn't "interfere" is not a problem. On the other hand, any spurious RF generated by a BPL system which prevents a licensed user from communicating with (or receiving a signal from) a station which would have been intelligible had the BPL system not been active should be considered harmful and must be eliminated. Also, any constant, periodic noise (such as that from an OFDM carrier) that intrudes into frequencies used by a licensed radio receiver must be eliminated. BPL system providers must not be allowed to "redefine" harmful. I'm sure most consumers would consider it quite "harmful" if their television signal was interrupted once per second by a blast of noise. I'm sure most consumers would consider it quite "harmful" if their cell phone received annoying little carriers at a 1Hz rate interfering with their communication. I'm sure most AM broadcast listeners would consider it quite "harmful" if their favorite talk radio program was interrupted once per second by an OFDM carrier. Licensed radio users are no different. The only difference is in the number of licensed radio users that will complain.
- 2) BPL systems should be required to employ some form of RF identification scheme. In other words, there should be some way for licensed users of the HF radio spectrum (or any other knowledgeable, concerned citizen) to identify an interference source as being a BPL system. Simply looking for the nearest BPL system in some database may not be sufficient, since it may be possible for the interference source to be located a long distance away. One solution may be to require BPL systems to transmit some sort of easily discernable signal at some well known frequency (or frequencies) on a periodic basis to help those

- experiencing interference to find the source. Among other things, this type of regulation will greatly reduce the number of false interference complaints against BPL providers. This type of RF identification scheme has already been proposed by the Commission for wideband wireless systems operating in the 5GHz range. There is no reason that this type of scheme should not also be required for Access BPL systems.
- 3) Consideration should be made for mobile/portable HF transceivers. The NPRM suggests interference mitigation techniques which appear to only be suitable for interference to/from fixed stations. What happens if public safety personnel (using HF radios) enter an area serviced by BPL? What if there are few (if any) fixed stations in that area which forced the BPL service provider to solve interference issues. The mobile radio user may hit a wall of interference. Suppose this mobile user is responding to an emergency. BPL interference may cause catastrophic results in this case. Will BPL system operators be liable if their system prevents public service personnel from adequately responding to an emergency situation? Amateur radio operators routinely provide emergency communications from mobile or portable locations. These types of communications could be severely impaired by BPL signals that haven't been "notched" because there are no fixed radio operators in the area. There appears to be nothing in the NPRM addressing this. Something must be done to address the problem of mobile (or portable) radio operation and how interference mitigation can be done in this case.
 - 4) Consideration must be made for shortwave listeners and other receivers that scan the HF bands listening for broadcasts. These "users" do not transmit and thus adaptive mitigation techniques based on "RF sensing" are not applicable. It is vitally important (and required by International Treaty) that international shortwave broadcasts be protected from interference by BPL systems. In addition, frequency "notching" (as some have proposed) doesn't adequately deal with shortwave listening for several reasons. First, shortwave broadcasts are spread out across a large range of frequencies and shortwave listeners routinely listen to stations throughout the shortwave band. Notching is only applicable to "channelized" communications. Second, shortwave broadcasters routinely change frequencies requiring new notches each time they shift. Third, each time a frequency band is notched a different band of frequencies gets used. It's like "robbing Peter to pay Paul". Notching frequencies for one person means that another person's frequencies get new interference. Trying to shuffle the notches around just isn't practical.
 - 5) I propose that the rules for BPL systems include severe penalties for failure to respond to interference complaints in a timely fashion. The power line utility industry does not have a very good track record when it comes to responding to interference complaints. It is difficult to understand how the power line utility companies expect to resolve BPL interference issues (based on a brand new technology which they know little about) when they are unable to resolve interference problems caused by arc'ing wires and such which they have been

dealing with for decades. It is important that this be changed if BPL is to successfully “co-exist” with licensed radio users. Interference reports must be handled 24 hours a day/7 days a week and interference issues must be resolved immediately. The Commission must make it clear what “timely” means (lets say completely and thoroughly resolved within 5 business days or the system is shut down for example) and should make it clear that there will be large fines or penalties for failure to resolve issues in a timely manner.

- 6) The Commission has stated that BPL systems are still bound by Part 15 regulations and as such must cause no harmful interference to licensed radio users AND must accept interference from licensed radio users. I recommend that the Commission require all BPL service providers to adequately inform all BPL customers that BPL service may be unreliable when located near a licensed radio transmitter. Most consumers are unaware that consumer electronics (televisions, stereos, cordless phones, etc.) are bound by this regulation. Licensed radio transmitters (such as amateur radio operators, AM broadcast transmitters, television transmitters, cell phone transmitters, etc.) are routinely blamed by ignorant neighbors for interference problems that are almost always caused by poorly designed consumer electronics. It is vital that BPL customers be informed that nearby radio transmitters may negatively affect their BPL service and it is almost certainly not the fault of the transmitter. The Commission should require that a “hotline” be set up to deal with complaints by customers and should require BPL service providers to direct complaints about interference from nearby transmitters to this “hotline” rather than complaining directly to the owner of the transmitter. In other words, interference TO a customer’s BPL system by a nearby transmitter should be dealt with by the BPL service provider. The BPL service provider must not be allowed to “pass the buck”. The Commission may even want to require BPL service providers to guarantee a full refund for equipment and installation to customers that find their service to be unacceptable due to the fact that it can’t operate properly when located near a licensed radio transmitter. I recommend that the FCC require BPL service providers to obtain a signed “waiver” from all customers that states something like the following:

BPL service makes use of electronic equipment covered by FCC Part 15 regulations. Part 15 regulations allow BPL systems to use radio frequencies normally reserved for other licensed radio services including public safety (police, fire, etc.), amateur radio, television, radio astronomy, and governmental agencies as long as the BPL system does not interfere with any of these licensed radio services. Because Part 15 devices use frequencies reserved for other services, they are sometimes susceptible to interference from licensed radio transmitters. Interference to your BPL system may cause momentary, periodic, or frequent loss or degradation of service. Interference is rarely the fault of a nearby radio transmitter. Under FCC Part 15 regulations, your BPL service provider is responsible for solving interference problems that negatively impact BPL service. Under no circumstances should customers assume that this interference is the fault of a licensed radio transmitter or to otherwise attempt to prevent licensed radio operators from

operating their stations in a legal fashion. All interference reports should be directed to the BPL hotline: 1-800-xxx-xxxx. If a licensed radio station receives interference from the BPL system, the BPL system may need to be shut down until the interference can be eliminated. BPL systems are only allowed to operate as long as they do not cause any interference to licensed radio users. This may result in short or long term outages of service. Once again, this is rarely the fault of the radio transmitter, but rather it is a result of the fact that BPL systems use radio frequencies reserved for licensed radio stations. As long as BPL systems do not cause interference, they are allowed to use radio frequencies reserved for other users. Any customer that is dissatisfied with their service due to frequent outages caused by interference to/from the BPL system can immediately discontinue service with no penalty for early termination.....

- 6) The Commission should implement regulations that protect licensed radio users from ignorant individuals that see licensed radio transmitters as the “problem” whenever interference to/from a BPL system negatively affects their BPL service. Numerous attempts have been made over the years to label amateur radio operators, CB operators, and even cell phone transmitters as “nuisances”. Legal action has been taken numerous times against LICENSED radio operators operating their transmitters in a LEGAL fashion. These frivolous lawsuits cost licensed radio operators thousands of dollars to fight and cause cities and subdivisions to enact regulations restricting licensed radio operation. All of this occurs because people are ignorant of the Part 15 regulations and ignorant of the fact that interference is rarely the fault of the transmitter. BPL has the potential to exacerbate this problem. What will happen when licensed radio transmitters cause a BPL system to malfunction? What will happen when a BPL system must be shut down because it is causing interference to a licensed radio receiver? The answer is that customers will blame the licensed radio operator rather than the BPL service provider. In some cases BPL service providers may even attempt to blame licensed radio operators. This must not be allowed. The Commission must protect licensed radio operators from the frivolous lawsuits and Draconian restrictions that will result when consumers lose BPL service due to a nearby licensed radio transmitter.

I will now attempt to comment on paragraphs within the NPRM.

In the Introduction, paragraph 1 you state “...we must protect licensed radio services from any harmful interference that might occur. In this regard, we are proposing to require that BPL systems and devices incorporate capabilities to mitigate harmful interference should it occur”. My first question is: what do you consider harmful? I would consider any interference which prevents me from hearing stations that I could hear before the interference source began operating to be harmful. Would the FCC agree? I certainly hope so. I would also consider any interference that is above the noise level to be harmful, assuming that it isn’t momentary. BPL system providers must not be allowed to change the definition of “harmful” for their own benefit. I frequently listen to

(or communicate with) stations that are at (or below) the noise floor. Any increase in the noise floor will make this communication impossible. A noise floor increase of only 3 or 6dB could easily make or break these communications. My second question is: what is meant by “mitigate”? Webster’s dictionary defines mitigate as follows: “mitigate – to cause to be less harsh or hostile. To make less severe or painful”. I recommend that the wording be changed to indicate that interference must be prevented or eliminated, not just lessened a bit. I could easily see some BPL system provider claiming “I’ve done the best I can at mitigating...at least it’s better than it was...sorry it’s not good enough to prevent you from being unable to hear stations that you used to be able to hear”. It should be made clear that this will not be tolerated. Complete elimination of interference must be a requirement and must be enforced. If interference can be heard by someone listening to a receiver, then it must be considered harmful. Severe penalties for failure to correct interference problems should be in place.

In paragraph 2, the Commission describes various “low-power, unlicensed devices which have used the alternating current (AC) power lines to carry information by coupling radio frequency (RF) energy to the AC electrical wiring”. In footnote 3 of the Feb. 23 version of the NPRM the Commission stated that “Campus radio systems have been operating for over fifty years in the United States at many universities...Initially, the receiver and signal source were attached to the same electric power line. After the advent of the transistor radio, receivers are sensitive enough to be able to pick up enough radiated signal for adequate reception when placed next to the electric power line in a dormitory or other locations on the electric power lines”. First off, low-power systems of this type are limited in scope. They are limited to a small number of campuses, not entire neighborhoods or entire cities. Their negative impact to licensed users is somewhat limited by their limited scope. Access BPL has a much larger scope and cannot be compared. Second, your own statement here points out the fact that RF coupled to AC wiring can be heard by nearby receivers. I’ve spoken to several people that have worked on these types of “campus radio” systems or have spent time on a campus with one of these systems. I am told that you can hear the RF energy coupled to the AC wiring from quite a distance, not just “right next to the electrical outlet”. Why does the FCC believe that coupling Access BPL to AC power lines will behave any differently than the “low-power, unlicensed devices” spoken of in paragraph 2 and footnote 3? Isn’t it true that access BPL systems will behave in much the same way, causing interference on a much larger scale to anyone with a radio operating in the HF spectrum within a reasonable distance from any electrical wire carrying BPL? BPL proponents have claimed that their systems look like a “point source” for RF radiation and that RF does not radiate down the length of the transmission line? If that was true, then these “traditional low-power, unlicensed...campus radio systems” wouldn’t work would they? It is my contention that access BPL will create neighborhood (or city) wide “campus radio systems” where the RF broadcast is wideband noise that will interfere with any HF radio receiver in the area.

Also in paragraph 2, the Commission states “These new designs have led to the development of new BPL systems that use spread spectrum or multiple carrier techniques and that incorporate adaptive algorithms to counter the noise in the line”. As an engineer who has spent years working on spread spectrum systems and other wireless systems I

can honestly say that I believe it is possible to develop techniques which will “counter the noise in the line”. This type of adaptive noise cancellation and adaptive equalization is common in DSL modems. The problem, though, is that these types of techniques only reject interference TO the BPL system...not FROM the BPL system. These types of techniques cannot be used to prevent a BPL system from interfering with a licensed radio receiver (such as a nearby amateur radio receiver) because they are all based on the ability to “sense” undesirable RF which won’t be present unless there is a nearby transmitter. Many licensed radio users (shortwave listeners, amateur radio operators, public safety, etc.) spend most of their time listening for (in many cases very weak) signals across a wide frequency band. This type of operation is incompatible with an adaptive interference mitigation scheme that relies on “RF sensing” to detect the presence of a licensed radio station in the area. Something must be done to protect licensed users from interference generated BY a BPL system. The techniques described in this paragraph do nothing to protect licensed users from BPL interference. Of course BPL systems will employ these types of techniques. They would not work without them. On the other hand, BPL systems will work just fine while generating harmful interference to others. The only thing preventing interference to licensed users is strict enforcement of Part 15 regulations. The only way to prevent interference to licensed users is to strictly and swiftly enforce Part 15 regulations that require BPL systems to “not cause harmful interference to licensed users”. In addition, the definition of harmful must be adequate to protect licensed users from BPL operators that may prefer a definition that suits their interest. Any increase in the ambient noise level must be considered harmful. Existing noise levels are already too high.

Footnote #5 on page 3 of the Feb. 23 version of the NPRM says that “the low voltage transformer is a poor conduit for high-frequency digital signals, as it is intended to conduct 60Hz signals”. I would like to add that unshielded AC power lines are poor conduits for high-frequency digital signals, as they are intended to conduct 60Hz signals. This is a well known fact. RF conducted through unshielded wires almost always leads to interference.

Paragraph 7 states that in the NOI, the Commission “asked for comments on the probable interference environment and propagation patterns of BPL and the mitigation techniques used by BPL to avoid interference”. In response, thousands of individuals and a few professional organizations supplied theoretical papers describing the interference potential of BPL. At least 8 or 9 amateur radio operators reported harmful interference to their stations from nearby BPL test sites. The ARRL supplied test results (including video/audio tape recordings of horrendous levels of interference) documenting harmful interference in a BPL test area. Since the NOI, we have now learned that BPL signals can be heard up to 1 mile away from a BPL test system in Raleigh, NC with nothing more than a simple wire dipole antenna. Many individuals and organizations supplied both theoretical analyses AND real examples of BPL test site interference. It would seem that the Commission went ahead and issued an NPRM based on the assumption that somehow, someday, these systems will be able to coexist with licensed users. The BPL proponents continue to argue that there is no interference from their systems, yet several individuals and organizations documented interference in response to the NOI. Who is

right? The Commission needs to seriously investigate these claims and determine whether now is the right time to deploy these systems. Clearly, they are not “ready for prime time” at this point. I believe the Commission has already acknowledged that all of the “kinks” have yet to be ironed out. No amount of wishful thinking is going to change the laws of physics. Please consider the claims of these individuals and organizations. Please investigate them for yourself. Please don’t ignore the pleas of those that could be harmed by this technology. Please don’t just “hope” that mitigation techniques will be determined, but rather take a proactive stance and require them to be in place BEFORE deployment. As I stated earlier: if mitigation techniques actually work and BPL can be deployed without harmful interference to licensed users then everybody wins. No licensed user can possibly complain if interference concerns never materialize. All we ask is that the Commission do some serious testing of the interference claims and make sure that mitigation techniques work before systems are deployed. As it is now, BPL deployment appears to put the cart before the horse.

Paragraph 8 contains numerous statements (mostly originating from BPL service providers who stand to benefit economically from BPL deployment) describing the potential benefits of BPL. Some of these benefits are questionable (such as improved competition), but I certainly can’t argue with the appeal of BPL. I believe it is “marketing hype” to suggest that BPL will somehow cause enough competition to existing technologies to either reduce service prices or create a better service to the consumer. In my area, DSL pricing has continued to rise even after cable modem service was offered. The obvious appeal of BPL is the “ubiquitous nature” of the power lines. No doubt about it...if it were possible to deploy BPL without undesired side-effects (like HF radio spectrum pollution) it would be appealing although other technologies seem much more appealing (fixed wireless, WiFi, WiMax, fiber, etc.). It is understandable why BPL proponents like the technology: it has the potential of providing them huge economic benefits (ie. lots of rich CEO’s of BPL component startups and lots of rich utility company executives). Unfortunately, this technology comes with a high cost: valuable HF radio spectrum pollution. We must not allow the “hype” or the desire for “broadband Nirvana” to cloud our vision: BPL as currently deployed in places like Raleigh, NC and Pen Yan, NY is HF spectrum pollution. The only question at this point is: how bad will it really be. BPL as currently deployed in Pen Yan and Raleigh is far too destructive for widespread deployment. BPL technology must be cleaned up considerably before it is suitable for widespread deployment. It is simply not appropriate to deploy this type of technology in the valuable HF spectrum where weak signal reception is the norm. It would be far more appropriate for BPL to operate in one of the unlicensed bands where unlicensed devices are expected to operate (NOTE - the Corridor Systems approach).

Also in paragraph 8 there is a claim that BPL can “advance homeland security”? What? You’ve got to be kidding. I would ask these companies to back up that claim. It would seem that everyone is jumping on the “homeland security” bandwagon. I question how well BPL can advance “homeland security” using an inherently insecure transmission medium. Any would be terrorist or hacker could not only access sensitive information

transferred over the power lines, but could easily put the BPL systems out of commission using radio jamming and other techniques.

Paragraph 14 of the February 23 version of the NPRM begins by saying “There is significant disagreement among the commenting parties regarding the interference potential of Access BPL”. Well, of course there is. The BPL proponents don’t want anyone to know about the interference potential because it could potentially halt their plans (and cost them millions or billions of dollars). BPL opponents (in some cases) have exaggerated the interference potential. Who is right? I think we all know that the potential exists. We all know that the laws of Physics have not changed. What is unfortunate is that rather than do independent studies to verify the truth, the Commission has chosen to go ahead with widescale deployment in the “hope” that the interference problems can be resolved later. What if they can’t? What if the licensed users’ concerns are right? Will the Commission enforce the Part 15 regulations and shut down BPL systems? The Commission has said that it will enforce these regulations and that BPL systems will not be allowed to interfere. What will happen to investor money that has been spent deploying a system that is unable to operate without causing interference. I hope you understand why licensed users are concerned. We are concerned that enforcing the Part 15 regulations will be extremely difficult if/when it is found to be impossible to deploy a BPL system without generating harmful interference. We are concerned that the Commission will have no choice at that point, but to look the other way. We are concerned that when “push-comes-to-shove” the licensed users’ concerns will be thrown by the wayside because of millions of dollars of lobbying money spent by BPL proponents. How can the Commission possibly enforce these regulations when BPL is so widely deployed, assuming the potential for interference is as high as some say it is? How can the Commission possibly enforce these regulations without a substantial increase in enforcement staff? How can the Commission justify this increase in enforcement staff during a period of shrinking federal income? My question is: why deploy this before we know for sure that the interference can be eliminated? Interference has not even been eliminated in the existing (small) test sites. How can it possibly be expected to be eliminated when deployed on a large scale in areas inhabited by large numbers of radio amateurs, SWL’s, and public service stations? Shouldn’t utilities be required to completely resolve interference issues in these small test sites before deploying their technology on a wider scale?

Also in paragraph 14 of the Feb. 23 version of the NPRM, the Commission quotes the ARRL when it states that “amateurs use very sensitive receivers and high gain outdoor antennas that could be located in close proximity to electric power lines” and that “current Part 15 limits are not sufficient to protect against interference in this situation”. I can attest to this. I live on a ¼ acre suburban lot with overhead power lines running along the street in front of my house. The distance from these lines to my antennas is about 150 feet. A Part 15 device radiating at the “legal radiated limit” can wipe out all but the most powerful HF stations. Probably less than 5% of all HF signals will be able to overcome this level of interference. 95% of all HF signals will be buried in the noise. As a concrete example, I bought a landscape light transformer last summer. After installing it I noticed that my HF noise level had climbed by about 30dB. Overcoming a

30db noise level requires the transmitter power to be increased by a factor of 1000. Assuming the transmitter was running 100 watts, it would have to increase its power by 1000 (a power output level of 100,000 watts) in order to overcome the increased noise level. Amateur radio operators are limited to 1500W PEP output. The transformer was located about 100 feet from my antenna (the same as the distance from one of my other antennas to the overhead powerlines). The transformer was subsequently tested by the ARRL and it was determined to be within the allowable radiated and conducted emission limits for a Part 15 device. In spite of the fact that it was within “legal limits”, this device raised the noise level by 30dB. This effectively wiped out at least 50% of all the stations that could be heard with the transformer disconnected. This is simply one example of how a Part 15 device operating at the “legal limit” can wreak havoc on an HF receiver. As another example, for several weeks I could hear what sounded like “data packet bursts” on my HF receiver every night. I originally suspected a nearby cable modem, but this turned out not to be the case. These bursts were approximately 25-30dB above the noise level and occurred at an average burst rate of about 1Hz. It took me a couple of weeks to track down the source of this interference. It turned out to be caused by a faulty neon light at a dry cleaner about 150 yards away. Within days after I finally identified this noise source, the faulty neon light burned out. The noise level from this device was strong enough to wipe out most weak signals and make it difficult to copy most medium strength stations. The only reason that it didn’t completely wipe out reception of weak and medium strength signals was that the noise was not constant, but rather came in bursts (much like packet traffic that would be seen from a BPL installation). I include this scenario in an effort to describe to you the difficulty of tracking down an intermittent noise source. It took me weeks to narrow down the source of the problem: and I’m a trained technologist. I also point this out because the noise level of these bursts is considerably lower than what can be expected from a BPL system. Imagine how difficult it would be for a typical consumer experiencing interference to TV channel 2.

In paragraph 15 of the Feb. 23 version of the NPRM, the ARRL contends that Access BPL will affect whole neighborhoods due to the fact that the AC powerlines act like an antenna to radiate the RF energy inserted onto the lines by an Access BPL device. As noted earlier, the Commission itself admitted that since the advent of transistor radios it has been possible for a transistor radio to pick up low-power, unlicensed AM “campus radio” stations that are broadcast over the powerlines. These “campus radio” stations used originally depended on conducted energy and could not be picked up by radio (radiated emissions), but no longer. These “low-power, unlicensed AM signals broadcast over the power lines” can be heard at a fair distance from any power line using a standard transistor radio. This is a well known fact. It is also a well known fact that if powerlines did NOT act as antennas (as the BPL industry claims) then transistor radios could not pick up these “campus radio” stations. It is clear that BPL devices WILL radiate RF across entire neighborhoods. To what extent, I don’t know, but tests have been done (by the ARRL, the JARL, and others) and have shown very high levels of interference to HF radio from these systems. It simply cannot be denied.

Paragraph 20 of the Feb. 23 version of the NPRM states that “BPL equipment manufacturers and service providers state that Access BPL does not pose an unacceptable

risk of increased interference to licensed radio services". They note that there have been no complaints of interference from BPL and that the existing Part 15 rules adequately protect incumbent spectrum users". First, there HAVE been interference claims. The ARRL has claimed interference to its mobile test station. At least 8 or 9 other amateurs complained of interference in their responses to the NOI. Since the NOI, there have been additional interference complaints (some partially resolved though) in the Raleigh, NC. area. One of the reasons that there have been "few complaints" is that nearly all (if not all) of the existing test sites contain no amateur radio operators and probably few (if any) shortwave listeners. Given the fact that most housing tracts built in the last 30 years contain CC&R's or HOA's that prohibit external antennas, it is not difficult to find a small test community (or sub-division) that has no HF amateur radio operators or shortwave listeners. Unfortunately, you can not assume that a lack of interference complaints when installed in a community like this is a fair indication of what will happen when BPL is installed on a large scale. Simply stating that there have been no complaints does not mean interference does not exist. Also, as I mentioned earlier...Part 15 rules do NOT adequately protect incumbent spectrum users, especially when the Part 15 devices are deployed on a large scale. As noted earlier, my HF receiver was made practically worthless by a "legal" Part 15 landscape light transformer. The only solution to the problem was to throw away the device and buy a new one. Imagine what would happen if every person on the block owned one of these. How could I possibly eliminate the interference if it was that "ubiquitous". I probably couldn't. The same is true of BPL. Finally, of course the BPL equipment manufacturers and service providers will say there is no interference. A BPL manufacturer admitting interference would be like General Motors admitting that their new SUV is a gross polluter. Nobody that wants to sell their product and make money is going to admit that it has serious defects. The bottom line here is: who cares WHAT the BPL manufactures or BPL opponents say....what are the facts. The FCC is responsible for making sure that systems are not deployed which cause widespread interference. I suggest that the FCC do a serious, unbiased test and find out who is right. Obviously, both sides cannot be right. It is simply not possible for both sides of this debate to be correct. Let's find out who is right. If BPL is as clean as the manufacturers claim, then they shouldn't be afraid to allow independent testing. If it is clean, then why not deploy it. If it pollutes, it should not be deployed until the pollution is eliminated. Licensed users are not opposed to BPL, but rather BPL-generated interference. If the interference does not exist, then licensed users have no complaint and should welcome BPL with open arms. Heck, most licensed users would also like broadband network access. If the interference DOES exist, then something must be done to eliminate it before deployment can proceed.

Paragraph 21 of the Feb. 23 version of the NPRM states that "The HomePlug Powerline Alliance (HomePlug) states that its member companies have widely deployed In-Home BPL equipment in the consumer market over the last 2 years and there have not been complaints of interference. HomePlug contends that joint testing by the ARRL and HomePlug has demonstrated a very low probability of interference between its devices and amateur radio use". What the Homeplug Powerline Alliance fails to state is that the HomePlug standard specifically avoids placing RF into the amateur radio bands. The most common recipients of HomePlug interference are amateur radio operators and

shortwave listeners. The fact that there have been few (if any) complaints by amateur radio operators is consistent with the fact that HomePlug devices are all designed to specifically exclude the amateur radio frequency bands. BPL devices may be a bit less “troublesome” and BPL system providers would receive far fewer interference complaints if they completely avoided all of the amateur radio bands as HomePlug has done, but this really doesn’t solve the problem. I must also add that the HomePlug Powerline Alliance stated that it believes the Part 15 regulations are sufficient and should remain unchanged. If the Part 15 regulations were sufficient, it wouldn’t have been necessary for them to avoid the ham bands. The fact that they avoid the ham bands is proof that Part 15 (by itself) is not adequate.

Paragraph 22 of the Feb. 23 version of the NPRM states that “A number of BPL proponents argue that the technical assumptions used by opponents of Access BPL to predict interference are incorrect. They dispute claims that the electric power lines will act like an efficient antenna...” First, I suspect that people like the ARRL would know a lot more about antenna modeling than a company trying to build BPL equipment. The analysis may be wrong, but it’s worth looking at. Surely, there must be engineers within the FCC that are capable of doing this analysis. Second, there is no need to “predict interference”. All you have to do is go to a location where BPL is operating and “experience it for yourself”. This has been done in Japan, England, Austria, and a number of places in the United States (including Raleigh, NC.). Strong (harmful) levels of interference have been found in all instances. The BBC issued a technical memo specifically detailing harmful interference to its shortwave broadcasts by one of the bigger BPL proponents: Main.net. BPL has been shut down in Japan and Austria due to interference problems. Does the Commission not believe these steps were warranted? Does the Commission believe that somehow the laws of Physics operate differently in the United States than in other areas? What about all of the interference reports from the BPL test systems inside the United States? Finally, the electric power lines WILL act like an antenna. It may not be an “efficient antenna”, but it will act like an antenna. My landscape light transformer was connected to my home’s AC wiring. This wiring radiated noise from the transformer well enough to raise the noise level on my HF receiver by 30Db. Is my AC wiring a “good antenna”? No. Is it good enough to radiate spurious RF and interfere with a licensed radio transceiver 100 feet away? Absolutely. Will BPL behave differently? I don’t think so.

In Paragraph 22 of the Feb. 23 version of the NPRM Southern states that “signals on power lines will tend to cancel each other out”. First, where’s the proof? Second, who needs theory: just go to a BPL test site and measure the interference. Reports from Raleigh, NC indicate that BPL noise can be heard at least 1 mile away. It doesn’t sound like the signals “cancel each other out” to me.

In Paragraph 22 of the Feb. 23 version of the NPRM Southern also states that the “BPL signal injection point can appear like a point-source radiator, with the power line having characteristics somewhere between a waveguide and an antenna”. What? If BPL looked like a point source then so would the “Campus Radio” system pointed out earlier by the Commission. The signal strength may be higher at the insertion point, but RF will still be

radiated along the transmission line. What do they mean by “somewhere between a waveguide and an antenna”? OK, so it’s not a particularly efficient antenna, but...it’s an antenna nonetheless. It will radiate RF. The only question is: how much RF will be radiated and who will be negatively affected?

In Paragraph 24 of the Feb. 23 version of the NPRM Current Technologies suggests that BPL signal aggregation is unlikely due to the way they have designed their system. Main.net (the same company that the BBC said built a BPL system that caused harmful interference to the BBC signal) has made similar comments based on its system design. I would like to state that nothing in the NPRM or the Part 15 regulations requires all systems to be designed in this manner. Aggregation is possible (and probable) in any system not designed in such a manner. Maybe the Commission needs to consider regulations that require systems to be designed in such a way that aggregation is not possible. Let me also point out that the assumption here is that the signal levels are so small that they cannot be propagated via skywave and thus “aggregate” with signals from far away. I don’t believe it has been proven that BPL noise cannot be propagated via the ionosphere and/or troposphere. Main.net concludes this paragraph by mentioning that it has “successfully implemented its technology in trials and commercial operations in over 60 locations in 25 countries around the world”. Let me point out that Main.net is the BPL provider that operated a system which BBC blamed for harmful interference to its broadcast signal.

Paragraph 25 of the Feb. 23 version of the NPRM states that BPL proponents claim that their systems comply with the current Part 15 requirements. Let me state that meeting the “legal” conducted and radiated limits is not sufficient to meet the Part 15 requirements. A Part 15 device becomes “illegal” whenever it causes harmful interference to a licensed radio user. This is a fact that most equipment manufacturers seem to ignore. Unfortunately, the burden of enforcement of this aspect of Part 15 is left up to the consumer (or the licensed radio user). I believe the Commission should explicitly state that Part 15 requirements do not end at conducted and radiated limits, but rather continue for the life of the product. Operation of a Part 15 device in a manner which causes interference to a licensed radio user immediately makes the Part 15 device a “nonconforming” device. Any suggestion by equipment manufacturers that adherence to conducted and radiated limit levels is sufficient to claim that a system “conforms to Part 15 regulations” should be squashed immediately.

In Paragraph 26 of the Feb. 23 version of the NPRM, Ambient Corporation states that it is possible to avoid interference to nearby transceivers using the inherently frequency agile characteristics of Orthogonal Frequency Division Multiplexing (OFDM) technology. Ambient states that if a sub-band is being used by a nearby transceiver, the BPL modem transmitter can be programmed to avoid transmitting on that sub-band, or “notch” it out. First, nothing in the NPRM or the Part 15 regulations require BPL systems to use OFDM. In fact, I believe some of them currently use DSSS which I believe is more difficult to “notch out” than OFDM. Second, this may not take care of spurious emissions or harmonics. An OFDM signal is not “brickwall” filtered to be within a small frequency range. There will be “out of band” harmonics and spurious RF

due to the fact that filters aren't perfect. In order to effectively "notch" out frequencies, an OFDM system may need to stop using multiple sub-bands in order to guarantee that harmonics are not present in other sub-bands in which nearby transceivers operate. Yes, this technique could work but may reduce the overall bandwidth of the BPL system to such an extent that BPL system providers may be reluctant to employ this "notching" until they are forced to do so by the Commission. In addition, the level of "notching" required could be very high (60dB or 70dB of attenuation) and achieving this level of attenuation could be impractical (if not impossible). Once again, "notching" puts the burden of interference mitigation on the licensed user since the BPL system provider will likely not "notch" anything until it receives interference complaints. Many people will experience interference without being able to determine the source. Your typical television viewer will not have any idea why channel 2 or channel 3 has such poor reception all of a sudden. They will have no idea that BPL is the source of the problem. The BPL system provider may also try to avoid responsibility because "notching" could reduce BPL system bandwidth, degrade system performance and thus reduce profitability. Notching can reduce available bandwidth and can increase equipment costs. BPL system providers will be very reluctant to do either of these. The only way to make sure that this type of thing happens is through strict enforcement of the Part 15 regulations. Licensed users are concerned that enforcement will prove difficult.

Paragraph 30 of the Feb. 23 version of the NPRM is a description the Commission's perceived benefits of BPL. I would have to agree that if BPL can (as the Commission believes) be deployed without causing interference to existing licensed users of the HF radio spectrum then there is certainly a benefit.

Paragraph 31 of the Feb. 23 version and Paragraph 9 of the Federal Register version of the NPRM describes the concerns of existing HF radio users. The Commission states in these paragraphs that "we believe that these interference concerns can be adequately addressed". Also, in Paragraph 9 of the Federal Register version of the NPRM the Commission states that "We believe that Access BPL systems can operate successfully under the non-interference requirements of the part 15 rules". Obviously, the Commission believes that interference concerns can be adequately addressed. My primary question is: how do we KNOW that they can be addressed. Shouldn't adequate interference elimination techniques be proven BEFORE widespread deployment. If interference hasn't been eliminated yet in Pen Yan, NY, Manassas Va, or Raleigh, NC then why does the Commission believe it can be eliminated when deployed on a much larger scale in areas that may be more sensitive to the interference due to a more dense concentration of existing HF licensed users. I would like to see interference elimination techniques in place before any further deployment. If interference to licensed users can truly be eliminated, then we will all benefit. All that I (as a licensed user) ask for is that deployment not be allowed to continue until proven interference elimination techniques are in place. What will the Commission do if systems are deployed on a large scale only to find out that interference "mitigation" is far more difficult (if not impossible) than expected? Progress Energy (in Raleigh, NC) has already drawn a "line in the sand" and essentially stated that they are unable to reduce interference any more than what they've already done. Doesn't this prove that interference elimination is far more difficult than

originally believed? What will happen to the licensed users? What will happen to BPL system owners? What will happen to the many investors in this technology? It would seem prudent to make sure that these “adaptive interference mitigation techniques” really work before deploying the system on such a wide scale.

Paragraphs 33 and 34 of the Feb. 23 version of the NPRM once again contain statements indicating that there are differing views on the potential of interference and that the Commission believes the likelihood of interference is low. It further states that the Commission believes that interference issues can be resolved if they arise. In Paragraph 34 it even goes so far as to state that: “hundreds of kinds of unlicensed devices are successfully operating under the current Part 15 limits without causing harmful interference to licensed operations”. This statement is only partially true. Here are some reasons why:

- 1) Most unlicensed devices are operated in areas where there are no nearby licensed radio users and thus they don't cause a problem. Many of these same devices WOULD cause problems if operated near a licensed radio station. A case in point is my walkway light power supply which I had to replace. If it had been owned by any neighbor within about 100 or 200 yards of my home (about 3 to 6 houses away) it would have caused harmful interference.
- 2) Most unlicensed devices are very limited in their potential to interfere because most of them are not designed as broadband communication devices. For example, a switching power supply has a specific switching frequency. It will tend to generate interference at the switching frequency and multiples thereof. The strength of the harmonics will decrease as you get farther away from the fundamental frequency. Microprocessor based equipment is similar. BPL is different. BPL is more like HomePlug in that it specifically radiates a very wide band of frequencies and thus will tend to cause much more interference. HomePlug avoided harmful interference to amateur radio operators by not injecting signal energy into the amateur radio frequency bands. If BPL does not do the same, it WILL cause wideband harmful interference to nearby receivers. Even if BPL avoids amateur radio frequency bands, it will still cause interference to international shortwave bands, public safety bands, etc.
- 3) There are cases of harmful interference which people don't report or don't know the source. I have an interfering signal in my neighborhood that I originally thought came from a cable modem. It took a couple of weeks to track down the source: a neon light at a dry cleaner about 150 yards away. I am very well trained in such things, yet it was difficult to find the source. It would be impossible for the typical consumer to find the source of interference if (for example) it were occurring to their television channel 2 or 3.

The bottom line is: existing Part 15 devices DO cause harmful interference, BUT solving the interference problem for most of these devices is easier than it would be with BPL. As noted earlier, the existing Part 15 radiated emission limits are not sufficient to protect sensitive HF radio receivers. A device radiating at the Part 15 “legal limit” near an HF radio receiver can easily wipe out reception of more than 95% of the signals that could be heard without the interference. My own experience with switching power supplies, televisions, touch-lamps, etc. has proven this to be the case. BPL will exacerbate this

problem by transmitting this interference down a power line that stretches throughout an entire community. Unlike my walkway light power supply (which I had to discard and replace with a non-interfering supply), BPL cannot be easily replaced. It is hard enough to figure out that the source of harmful interference is my neighbor's heated dog dish or electric blanket. It is even harder to find some way of convincing the neighbor that the device needs to be fixed, replaced, or discarded. It would be impossible if every home in the neighborhood had a device considered "essential" (like a television or computer) that radiated this amount of RF. You could not solve this problem. BPL is the same way.

Paragraph 35 of the Feb. 23 version of the NPRM contains particularly disappointing statements from the Commission, which should have a good enough understanding of the physics of radio to understand that these statements are not accurate. First, the Commission notes that "noise from power lines, absent any Access BPL signals, already presents a significant problem for amateur communications. We therefore would expect that, in practice, many amateur already orient their antennas to minimize reception of emissions from nearby electric power lines. Further, we note that many Access BPL technologies have the capability to avoid using specific frequencies, if necessary, to avoid interference....". First off, yes, power line noise IS a significant problem (as is an ever increasing ambient noise floor generated by all of the Part 15 devices being deployed daily), BUT:

- 1) It is primarily an issue on frequencies below 10MHz. It is particularly troublesome below 4 or 5MHz. BPL would cause interference all the way up through 50 or 80MHz, in frequency bands that currently enjoy relatively quiet conditions compared to those below 10MHz.
- 2) Power line noise has an often well defined "signature". Power lines operate at 60Hz. Most power line noise has a fundamental frequency of 60Hz. Because of this, it is sometimes possible to filter out this type of noise. Things like arc'ing are more difficult, but basic AC hum can often be filtered. BPL signals are "random" in nature. They carry random data packets and some BPL systems intentionally spread their signals using direct sequence spread spectrum modulation which makes things even more "random". Random signals cannot be filtered in this way.
- 3) Amateur do not deal with power line noise by turning their antennas away from the power lines. Most amateurs don't even have rotatable antennas that operate below 10MHz (where power line noise is greatest). Amateurs deal with power line noise by identifying the source, filing a complaint with the power company, and constantly bugging the power company until the problem is resolved. In many cases, the power company takes a long time to solve the problem if at all. Re-orienting antennas does not work.
- 4) The laws of physics do not allow an amateur with a rotatable antenna to simply aim it away from noisy power lines. Imagine that I live in California and wish to communicate with (or listen to) a station on the East Coast (say Washington DC). Next, suppose I live on the west side of a street that runs North-South and there are overhead power lines running down the street. This puts the power lines directly in line between me and the East Coast station. I cannot simply rotate my antenna to point West. No amount of wishful

thinking will allow me to aim my antenna West (away from the power lines) and receive a station to the East (directly through the noisy power lines).

Orienting an antenna to avoid the power lines is simply not possible.

Second, although some BPL systems may have the ability to avoid frequencies used by nearby radio transceivers, unless the Commission REQUIRES this it won't be true in all systems. If the ability to avoid frequencies used by nearby transceiver is necessary, then this should be a requirement of BPL systems.

Paragraph 36 of the Feb. 23 version of the NPRM contains statements by the Commission indicating that it believes that BPL interference will not be widespread. The Commission suggests that most of spurious radiation will occur near access points, repeaters, etc. First, it is important that safeguards be in place that will eliminate interference to a radio transceiver that just happens to be located very near an access point, repeater, etc. Second, the "campus radio systems" described earlier are an example of a system where enough signal energy is radiated along the power line that simple transistor radios can receive it. Why does the Commission believe the same won't be true of BPL?

Paragraph 37 of the Feb. 23 version of the NPRM and Paragraph 13 of the Federal Register version contain statements by the Commission indicating that it believes that the "potential for interference to non-amateur radio services, such as public safety, maritime, and other operations is low". The potential of interference to maritime would seem to be low, but interference to public safety could be significant if we are talking about mobile public safety operations. The NPRM does not address the problem of mobile operations. Mobile public safety operations could be severely impacted by BPL interference, since it is not possible to fix the interference problems while responding to an emergency situation. I recommend that the Commission consider rules that will adequately address the issue of mobile operations. In this paragraph and in Paragraph 9 of the Federal Register version of the NPRM, the Commission asks: "Should we require Access BPL systems to coordinate with public safety agencies that use the HF band for state-wide public safety communication. Yes, I believe the Commission should require BPL system operators to coordinate with public safety agencies that use the HF band!

In Paragraph 38, the Commission recommends exempting BPL from the existing conducted emission limits since radiated emission limits are still in place. I would agree with this, except for one concern. How can a licensed radio operator (or other concerned citizen) avoid having BPL signals conducted into their own home wiring. In other words, how can people that don't want BPL service filter it out before it reaches their property line to avoid additional interference caused when BPL is conducted via power line into their home? I recommend that the Commission add rules that would require BPL system operators to provide an "opt-out" mechanism by which consumers can filter out ALL BPL signals at the nearest transformer (or whatever) before they reach the consumer's home.

In Paragraph 13 of the Federal Register version of the NPRM the Commission states that "In analyzing the potential for harmful interference to public safety systems we took into

account the fact that low-level part 15 signals from Access BPL devices attenuate rapidly as the distance from the device increases; and that most public safety systems are designed so that mobile and portable units receive a signal level significantly above the noise floor”. Signals from an Access BPL device will attenuate as the square of the distance from the device. In other words there will be a 6dB drop in signal power for every doubling of frequency. An Access BPL device radiating a signal at the Part 15 “legal limit” can easily generate a signal that is 50dB above the ambient noise level 30 meters away from the source. This signal will not drop below the noise level until the receiver has moved to a distance of $(2^{**}8)*30$ meters away. This is apx. 7500 meters or apx. 3 miles. My question is: how much above the noise level are these public safety systems? Unless they are > 60dB above the noise level, an Access BPL system can interfere with public safety communications when the public safety systems is within 30 meters of an Access BPL system. I suspect that it is very common for public safety systems to operate with SNR’s much lower than 60dB.

Also in Paragraph 13 of the Federal Register version of the NPRM the Commission goes on to state that “Therefore, it appears that the interference protections we propose herein—and the strict “no interference” restriction inherent in the part 15 rules – will be adequate to foreclose such rare instances of harmful interference to public safety systems”. This may be true if the public safety system in question is a “fixed ground station”, but is not true if the public safety system is either mobile or portable. Nothing in the NPRM proposes a solution to the problem of mobile or portable operation of an HF licensed radio station. The only thing discussed that MAY help is the suggestion that BPL providers be required to coordinate with local public service users that use the HF/VHF spectrum in the area.

In Paragraph 15, the Commission proposes requirements for BPL systems to provide the capability to mitigate or avoid interference through dynamic or remote means. Let me point out once again that “mitigation” is simply not enough. Interference elimination must be a requirement. Second, let me suggest that the problem with this requirement is that it assumes that the frequencies that must be “avoided” are small in comparison to the overall bandwidth consumed by the BPL system. What if the BPL system is interfering with a local amateur radio operator or shortwave listener that uses many megahertz of the frequency spectrum. The total amount of space allocated to amateur radio below 80Mhz is approximately 3.5MHz. This could account for as much as 10% of the available BPL bandwidth. This only covers amateur radio frequencies. What about international shortwave, television channels 2 & 3, public safety frequencies, etc. It is not practical for BPL vendors to avoid all frequencies that are used in the locality since it will severely reduce available BPL bandwidth. As a result, BPL vendors will attempt to avoid these techniques which will create a feud between the BPL providers and private citizens. “Frequency notching or avoidance” will only work if the number of frequencies that must be avoided is quite small. When there are amateur radio operators and/or shortwave listeners in the area (esp.) this may not be the case.

In Paragraph 16, the Commission discusses why it believes “frequency avoidance” and “frequency notching” are practical. It includes quotes by both PowerWAN and main.net

which indicate that their (presumably OFDM) systems can easily avoid troublesome frequencies. My understanding after hearing about the trials in Raleigh, NC is that both of these techniques have proven to be much more difficult in reality for several reasons. First, many of these systems are based on off-the-shelf chips (the “DS2 chip set”) which use large blocks of frequencies (6Mhz wide I believe). The assumption of these chips is that there are no gaps in the middle of one of these “blocks”. Fitting these blocks between amateur radio bands has proven difficult (from what I have heard). It has been especially difficult for operators to adequately remove interference from the amateur radio 17 meter and 24 meter bands. Also, there are spurious emissions and harmonics of these BPL systems which must be filtered out. My understanding is that it has been difficult to avoid having BPL band edges overlap nearby amateur radio bands due to less than perfect bandpass filters in the BPL systems. Notching is not as practical as one might think since the level of notching required to protect a sensitive nearby receiver is probably somewhere in the 60dB or 70dB region. Notching out 60 or 70dB may not be practical. Finally, main.net talks about “on the fly” adaptation. “On the Fly” adaptation may be useful in protecting a BPL system FROM another radio service. A BPL system could easily detect RF from another radio service and avoid those frequencies. Unfortunately, this does not protect other licensed receivers from interference generated BY a BPL system since there is no way for a BPL system to know that there is an active receiver in the area.

In Paragraph 17, the Commission proposes a “shut-down” feature and asks for comments on the proposals set forth earlier. There are several fundamental problems with the proposals put forth by the Commission. The first problem is that there is an assumption that radio users affected by BPL are confined to very small frequency bands which can be easily avoided (or filtered) if necessary. This is simply a false assumption if you include amateur and shortwave communications. Both the amateur radio and international shortwave frequency bands are quite large and scattered throughout the HF spectrum. The second fundamental problem is that these proposals put the burden of interference identification on the licensed radio user. It would seem to be backwards to expect licensed users of the radio spectrum to bear the responsibility of finding interference sources and filing complaints. Another problem with these proposals is that enforcement of the “non-interference” requirements of Part 15 will be difficult and punishment for offenses is not specified. BPL service providers must be forced to eliminate interference to licensed users within a very short, specific period of time. The punishment must also be great enough to deter them from ignoring interference complaints. Another problem with the proposals is that it “assumes” that frequency avoidance and “notching” are practical. I’m not convinced of this, esp. for DSSS modulation schemes. Frequency avoidance may work for the amateur radio 7MHz, 14MHz, 21MHz, and 28MHz bands since they are all multiples of one another. This makes it much easier to avoid the effect of harmonics. Frequency avoidance for the 18MHz and 24MHz bands is more difficult since any RF injected into the 9MHz band or 6MHz band will generate 2nd or 3rd harmonics (respectively) in the 18MHz band, etc. In Raleigh, NC. the system operators have attempted to avoid interference to the 7MHz, 14MHz, 21MHz, and 28MHz bands by avoiding the use frequencies that will place significant RF levels in these bands. This has been moderately successful. The system operators have found it much more difficult

to avoid interference to the 18MHz and 24MHz bands because they are attempting to use frequency “notching” instead of frequency “avoidance”. The level of notching required to eliminate the interference is quite high: probably about 60dB or 70dB. This has proven to be somewhat impractical. Finally, I fully agree that a “shut-down” feature is absolutely required.

In Paragraph 18, the Commission proposes a requirement for a “publicly accessible database for Access BPL information”. I recommend that this requirement be made more specific by requiring the database to not only be “public”, but to be accessible via the internet by anyone. I am concerned that placing this database in the hands of an “industry-operated entity” is like asking a fox to guard a chicken coop. It is my recommendation that the database be maintained by the Commission, with input from the BPL industry. The database should be up-to-date (within days) and should be easily accessible via the internet by anyone concerned about possible interference problems.

In Paragraph 19, the Commission proposes to maintain the Verification procedure for Access BPL equipment. The only concern I have with this is that the Commission is basing this on the belief that existing Part 15 systems seem to cause few interference problems, so there’s no reason to impose more strict rules on BPL. As noted earlier in my comments, the existing Part 15 rules DO NOT adequately protect licensed users from interference. The existing rules only work because the number of “noisy” Part 15 devices near existing radios is sometimes small AND because problems with isolated “noisy” devices can be solved by replacing the device. This is not the case with Access BPL carried on the power lines. It is far easier (and usually cheaper) to replace an isolated “noisy” Part 15 device like a light dimmer, a switching power supply, or even a television than it will be to solve interference problems caused by AccessBPL running down the street in front of your home.

In Paragraphs 20 and 21, the Commission asks for comments on measurement techniques. The Commission suggests “in-situ” measurements at numerous radials at a specified distance from the peripher of the pad mounted above-ground transfer and/or along a line parallel to the electrical wiring carrying the BPL signal. I recommend that additional measurements be taken along a line drawn parallel to the electrical wiring for a specified distance beyond the end of the BPL excited line. This is necessary to measure the signals that may be “boosted” by the fact that a long electrical wire carrying RF in this fashion may look like an “end fed antenna”. An end-fed antenna exhibits gain in the direction of the terminated end of the antenna. Unlike a dipole (which exhibits gain broadside to the antenna), this type of antenna has gain “off the end”.

Paragraph 21 contains a request for comments on the height of receive antennas used for radiated emissions measurements. I recommend that heights much greater than 4m be required. At a minimum, measurements should be done at a height equal to the height of the power line (or a typical power line). This would probably be somewhere around 10m or 15m. Doing so is important since RF propagation is somewhat dependent on antenna height and thus the strongest level of interference may not be found without an antenna at

least 40 or 50 feet in height. Ground reflections can increase the gain of an antenna by 10dB or more.

In summary, I would like to request the Commission to incorporate the following changes into the Part 15 regulations as they relate to AccessBPL:

- 1) Change all occurrences of the term “mitigate” to “eliminate” to guarantee that BPL providers cannot skirt around issues by claiming they have “mitigated” (or lessened) interference, but they are still causing interference.
- 2) Require access BPL systems to output a periodic “RF signature” to aid in locating the source of interference. This “RF signature” should be something that is easy to detect, not a complex OFDM or DSSS signal that can only be detected with complex or expensive test equipment. This “RF signature” should easily distinguish a BPL signal from power line noise, neon light noise, etc. so that no BPL operator can claim that the noise originates from some other neighborhood source. A typical home user should be able to use a simple AM, SSB, or CW receiver to demodulate the “RF signature”.
- 3) Require access BPL service providers to adequately inform customers that their BPL systems are susceptible to interference from nearby transmitters and that the system may be shut down if it causes interference to a nearby licensed radio station. Require access BPL service providers to make it abundantly clear that 99% of all interference issues are the fault of the BPL equipment and NOT the fault of the licensed radio transmitter. Require access BPL service providers to set up a “hotline” to be used by customers that believe their service is being impaired by a nearby transmitter. Require BPL service providers to follow up on these complaints to avoid conflicts that arise when customers seek out the owner of a nearby transmitter. In summary, make BPL service providers liable for any issues that arise due to the fact that their system doesn’t work properly when located near a licensed radio transmitter that is operated in a legal manner. Modify the Part 15 regulations as necessary to make sure that legal licensed radio transmitters are not blamed for problems caused by interference susceptible Part 15 devices such as BPL systems. This goes way beyond the simple Part 15 disclaimer which is never read (and isn’t understood) by most consumers. Whenever a Part 15 device (such as a TV or stereo) receives interference from an amateur radio transmitter, the consumer immediately blames the amateur radio transmitter. In many cases this leads to excessive antenna regulations in an attempt to stop amateur radio operation and in other cases it leads to court battles and neighborhood feuds. The responsibility for clearing up these issues MUST be put squarely on the Part 15 manufacturers: in this case the BPL service providers.
- 4) Specify minimum timeframes for interference elimination. Specify stiff penalties that will be imposed should interference not be eliminated within a reasonable timeframe. Clearly state that a BPL system that is not able to eliminate harmful interference to a licensed radio station within a reasonable period of time (lets say 1 week) must be shut down until the problem can be corrected. In summary, don’t allow BPL operators to “play dumb” and avoid dealing with the interference problems that will inevitably occur.

- 5) Require that the BPL database be available via internet to ANY person wishing to determine if their source of interference may be connected to a nearby BPL system. Require this database to be reasonably up-to-date (like no more than 1 week or 1 month old, for example).

In addition, I would like to request that the Commission consider the following BPL issues and provide adequate protection for licensed users affected as follows:

- 1) Mobile HF radio operators
- 2) Shortwave listeners
- 3) Consider how the Commission will enforce the Part 15 regulations in regards to BPL with the current level of staffing. Consider what additional staffing may be required to adequately enforce the regulations. Consider whether or not it is “safe” to deploy a technology that has such a high probability of causing interference when there isn’t enough staff to enforce the “no interference” requirements.

The bottom line is that I believe everyone knows that BPL is going to cause some level of harmful interference. The Commission believes that individual cases of interference can be dealt with and all can live happily ever after. I question this, but at this point the Commission has made its decision to allow this “dirty” technology to move forward. At this point all that licensed radio spectrum users can hope for is swift and thorough enforcement of the Part 15 regulations. It is my sincere hope that the Commission will not allow this technology to destroy the valuable HF radio spectrum and that it will not allow harmful interference to be generated by Access BPL. This requires enforcement. The industry cannot be self policing. The power industry does not have a good track record in regards to interference complaints. There is no reason to believe that it will be any better at responding to interference complaints related to BPL installations. It is imperative that the Commission make sure that adequate enforcement is possible, when allowing such a potentially damaging technology to be deployed. It is my hope that the Commission will do whatever it takes to protect licensed users, even when it is not a popular stance in the eyes of those that see BPL as a path to “Broadband Nirvana”.

Sincerely,

Kelly Johnson