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Reply to NOI 03-104

Dear Commissioners,

Adaptive Networks, on page 4 its NOI submittal suggests that testing of BPL systems should be done using wire lengths of $1/8$ wavelength, $1/4$ wavelength, and $1/2$ wavelength at the fundamental frequency of the device. This would seem to be impossible given that BPL signals are wideband, spread spectrum signals. In addition, it is well known that additional antenna gain can be realized with wire lengths of multiple wavelengths. Actual wirelengths in practice could be much larger than $1/2$ wavelength at even 80MHz. It is my suggestion that testing of BPL systems must be done with multiple wirelengths running all the way from the base frequency of the device (usually 1.7MHz) up to 80MHz with wavelengths of $1/4$, $1/2$, 1, etc. up to the longest wirelength expected in practice.

Ambient Corporation states that the FCC should “explore possible modifications to existing Part 15 rules to foster deployment of advanced versions of BPL technologies in ways which will avoid harmful interference to licensed uses...”. I strongly question whether this is even possible, given that it is a well known fact that a 30uV/m fields strength at 30 meters is strong enough to wipe out all but the strongest HF radio signals. An example of this is the old Phonex Wall adapter, which met FCC radiation limits for a Part 15 device, yet caused so much interference to the amateur radio service that it was subsequently recalled at a huge cost to the manufacturer. In fact, it is not even possible to deploy BPL under current Part 15 rules without causing harmful interference to licensed users of the HF and low VHF radio spectrum. Theoretical calculations make it crystal clear that even unintentionally radiated levels of RF within the current Part 15 limits when placed on power transmission lines have the potential of causing extremely large amounts of interference to licensed users. In addition to these theoretical calculations, ad-hoc testing of interference levels in BPL test neighborhoods shows conclusively that BPL creates huge amounts of interference levels to licensed users. BPL is so harmful to licensed users of the radio spectrum that it has been banned in Japan and parts of Europe. I recommend that a similar ban be enacted in the United States. Although deployment of this technology with no harmful interference to licensed users is a laudable goal, it just doesn't appear possible with the current technology.

The American Public Power Corporation suggests that failure to deploy BPL is somehow depriving people in rural areas of their “right” to broadband access. This organization claims that communications spending has slowed in the past 3 years and is now focused only on highly populated areas. It is true that communications spending has slowed and that most companies focus on areas where they can recoup their investment, but this is not a valid reason to deploy a technology that has a strong probability of creating large amounts of RF pollution in the HF and low VHF frequency bands and interfering with licensed users. APPC attempts to point out that “minor” groups (people that don't live in areas of high population density) are disproportionally deprived of modern technology and broadband access. Unfortunately, APPC (and many other proponents of this

technology) are either unaware of the harmful effects of this technology OR have no problem with causing harm to the “minority” licensed users in those frequency bands. BPL has been designed to avoid the AM broadcast bands for a reason: because it is well known that this would create interference. There would be a huge public backlash if the AM broadcast bands were interfered with by BPL. Unfortunately, the rest of the HF licensed users’ needs have been ignored by APPC (and others). This “minority” of HF users must be protected from the ill effects of BPL. This is why I recommend that we (as a country and industry) find ways of providing broadband communication to everyone using technologies that do not harm licensed users of the radio spectrum. DSL, cable modems, satellite communications, cellular, fixed wireless, and ad-hoc WiFi networks all provide reasonable delivery of broadband communications. We need to focus on technologies that work WITHOUT causing harmful interference to other licensed users.

Ameren Energy Communications Inc. “urges the Commission to give considerable weight to the many successful field tests underway by entities like AEC, and not to rely unduly on test models or speculations of interference”. Unfortunately, speculations are all that can be made in some cases since AEC does not appear to be willing to allow for independent testing of interference from their systems and does not appear to wish to allow licensed users of the spectrum they wish to pollute to do their own interference testing. To the best of my knowledge, AEC has never attempted to allow licensed users to verify that these BPL test sites do not generate harmful interference to licensed users of the HF and/or VHF frequency spectrums. I recommend that the Commission require all BPL test sites to include testing by all licensed user organizations that stand to be harmed from interference. It must be a requirement that these BPL systems prove beyond a shadow of a doubt that they will not contribute to this RF pollution before they are allowed to be deployed in even small test markets. AEC also states in its submittal that “AEC has not had a single reported instance of interference in relation to its BPL technical trial, which runs by approximately 300 homes. I would like to point out that a 300 home sample is not representative of the population as a whole and cannot be considered by any logical thinking person to be adequate proof of the lack of interference. It is quite possible that a 300 home trial could take place in an area with few (if any) licensed users of the HF and lower VHF spectrum. A 300 home sample is not sufficient to show that interference will not be encountered in other areas. The only way to determine if interference will be a problem is by measuring field strengths near BPL test sites and by doing thorough testing with the BPL provider AND licensed users in a BPL test area. I spent months tracking down 2 sources of RF interference in my own neighborhood. One source was a Neon light at a nearby dry cleaner (100 yards away) and the other was a very poorly designed landscape lighting power supply (which I have since discarded). As a trained EE and amateur radio operator I have a fair amount of experience in these types of things and it still took me quite some time to track down the source of the interference. In addition, I still have other sources of interference that I have been unable to track down for nearly 2 years. Both of the known sources of interference are from Part 15 devices which apparently meet FCC standards yet they caused considerable levels of harmful interference to my amateur radio station. Very few people are even aware of the interference potential from BPL and fewer people still would know how to identify and complain about it. It is not surprising that AEC could

find a test market where there are few (or no) licensed users (like amateur radio operators or short wave listeners) in the neighborhood. It is also not surprising that they would not have interference complaints. Once again, lack of complaints on a small scale (and probably a heavily controlled test) does not mean there won't be interference when deployed on a large scale. AEC also suggests that frequency notches could be inserted into the system to avoid interference to particularly sensitive frequency bands. There are several problems with this approach:

- 1) It limits future frequency allocation changes
- 2) It could limit the bandwidth available to the BPL system
- 3) It ignores the issue of harmonics in out-of-band frequencies
- 4) It ignores users of spectrum that lack large "political voices"

AEC rejects "analytical models" that some have used to show the interference potential of BPL systems, yet AEC seems unwilling to allow licensed users to do "real-world" testing of the BPL systems under test. Why is that? Could it be that AEC knows all too well how much interference is possible from these systems? In summary, AEC has stated numerous times that there is no interference risk yet no proof has been presented other than to say "there have been no complaints". This is not a very scientific proof I must say. I urge the Commission to require adequate, thorough testing of all BPL test sites with interference to licensed users of the radio spectrum in full consideration. I urge the Commission to invite industry professionals from all licensed users of the HF and VHF spectrum to evaluate the real interference levels of these systems. If, after a fair and independent test (not one completely controlled by AEC or any other company with a profit making agenda), it can be shown that these systems generate harmful interference to licensed users nearby then I urge the Commission to immediately ban deployment of such systems and begin the search for a more suitable broadband alternative. We already have cable access, DSL, satellite, cellular, fixed wireless, and ad-hoc WiFi networks. We do not need another alternative if it means that we pollute a valuable resource in order to acquire it. It's just not worth it when there are reasonable alternatives already. The HF and lower VHF frequency bands are extremely valuable due to their unique propagational properties. It would be a shame to pollute this small and extremely valuable resource when it is not necessary.

Amperion designs access equipment that uses WiFi as the final link to the end user. If designed properly, a WiFi system will not cause harmful interference to licensed users of radio spectrum. This is especially true since WiFi uses specific frequency bands that are reserved for Part 15 intentional radiators. Unfortunately, Amperion suggests that a BPL network be used to route data into the neighborhood before it is sent to a WiFi modem. I must ask the following question: why is BPL needed at all? The proponents of BPL tout that it is because they say that "the infrastructure is already in place" and therefore it is possible to deliver services to people in areas where it is not economical to install DSL, cable, etc. Installing WiFi systems in neighborhoods means that significant infrastructure is required. If this is true, why not avoid the BPL portion of the network in the first place? Amperion also states that their equipment is "Part 15 compliant". This may be true, but it doesn't mean there is no interference potential. As I stated earlier, part 15 "compliant" devices often DO cause harmful interference. The only reason the current Part 15 device system works is because until recently, part 15 devices were more

“isolated”. Part 15 devices were not as pervasive as power lines, usually generated less RF radiation, and could be moved, removed, filtered, or altered as interference was found. BPL systems do not fit this model. A person experiencing interference cannot just go to the local electronic store and buy a filter to solve the problem or replace the offending device with something that does not cause interference. The very thing that BPL proponents like about power lines (the fact that they are ubiquitous) is the very thing that makes interference generated on those power lines impossible to cure. I urge the Commission to first of all, reconsider the allowable radiation limits of Part 15 devices since they are becoming more and more pervasive in society and are responsible for the ever increasing base noise level in modern neighborhoods. Second, I urge the Commission to ban BPL deployment since it does not fit the original model of Part 15 devices and will cause unnecessary levels of harmful interference to be thrust upon neighborhood after neighborhood. Finally, Amperion tugs at the “hearts and minds” of the Commission by suggesting that this technology will finally provide broadband access to rural areas not currently served by other broadband technologies. I urge the Commission to look beyond the rhetoric and recognize that a) Amperion is primarily interested in profit, not humanitarianism and b) that this issue is about science (and I don’t mean junk science). If Amperion is so sure that this system won’t generate harmful interference then I challenge Amperion prove it by allowing fair independent testing of their system by licensed users of the HF and VHF spectrum.

Current Technologies, LLC states that “BPL devices are point-source emitters...The entire power line does not act like an antenna”. I urge the Commission to challenge this claim. Current Technologies, LLC states that “there has been a bottleneck at the last mile – more precisely, the last few hundred meters – that separate the end user from the high-speed network. They also say that installation of their system only requires a small piece of equipment located on top of the electric pole for each 5-8 homes. Hmm...sounds like a candidate for WiFi to me. A lot of time is spent explaining why using power lines is necessary because the infrastructure exists, yet in every case I am aware of there are pieces of equipment that must be added to the poles in the neighborhood for the BPL system to work. At that point, what is the difference between BPL and WiFi or any other technology for that matter. The “supposed” advantages of BPL are not so important. I urge the Commission to consider other alternatives for the “last mile”: ones that don’t destroy the radio spectrum for other users. We have the technology and new technologies are born daily. We don’t need to accept a technology with such negative consequences. I suggest that WiFi, fixed wireless, and even satellite are capable of meeting the needs of the last mile without such negative consequences.

Electric Broadband proposes making BPL devices class A devices. Their argument is that class B is reserved for “inside the dwelling”. I live in a residential district of my city. My entire lot is zoned “residential”. I am required to live by the zoning regulations of a “residential district” which means I can’t do anything on my property which is reserved for “commercial districts”. A BPL device should be the same. If it is used in a “residential neighborhood” (even if it isn’t inside a dwelling), it should be a Class B device. Electric Broadband also wants to raise emission limits. As I stated before, I experience harmful interference in my neighborhood DAILY from part 15 devices well

within the FCC's part 15 limits. The existing standards are already too lax and should not be raised. In fact, the part 15 limits should be tightened and susceptibility limits should be instituted as well since the consumer electronic industry (in its haste to make greater profits) continues to produce part 15 devices which are very susceptible to interference and make it more difficult for licensed users to operate next door to people that don't like getting interference on their poorly designed consumer electronics. Electric Broadband goes on to claim that increasing interference levels will increase the speed of broadband rollout and thus accelerate the rollout of fiber. I suggest that this is more marketing hype. Everyone knows that fiber to the curb is the real answer in the long run. The problem is that there isn't enough profit in it so companies like Electric Broadband are hoping to cash in on the interim solutions. Unfortunately, companies like Electric Broadband seem all too willing profit from an interim solution at the expense of existing licensed users of the HF and VHF spectrum.

The HomePlug Alliance suggests that existing part 15 regulations adequately protect licensed users from harmful interference. I beg to differ. I recently bought an apparently legal power supply for a landscape lighting system. The level of harmful interference was shocking, but still nowhere near the FCC part 15 limit. This device alone added at least 24db of noise to shortwave bands in the 14Mhz region. Other devices in the neighborhood also cause significant interference. The truth of the matter is that licensed users have been forced to tolerate these devices in spite of their harmful interference. The FCC is too understaffed to respond to all interference claims. HomePlug also fails to point out that the HomePlug standard voluntarily notches important amateur radio frequencies. If this had not been done, significantly larger numbers of interference complaints would have been received. If BPL is deployed in neighborhoods containing active amateur radio, amateur radio-astronomy, or short wave operators without notches in those respective frequencies it WILL generate harmful interference. There is probably no way to avoid it. Notching frequencies can be done, but there are downsides as I have mentioned earlier. What about all of the users that don't have a "political voice" loud enough to get their favorite frequency notched out?

I would like to commend the IEEE Power System Relaying Committee for a well written submission describing the importance of guaranteeing that there is no interference to licensed users of the frequency spectrum proposed for usage by BPL. This committee correctly states that interference to the amateur radio bands has been eliminated (or greatly reduced) by the use of spectral masks. Although I agree that this mechanism will work, it has several flaws, notably:

- 1) A large number of spectral notches would be required in order to adequately protect all licensed users of the HF/VHF bands, not just amateur radio bands
- 2) It would make it difficult (or impossible) to make frequency allocation changes at a later date in the HF/VHF bands

I would also like to point out that if spectral notches were employed, it would be extremely important that part 15 rules be modified to specify the required attenuation of the notched frequencies. Finally, I would like to add that just because a device meets the part 15 "letter of the law" does not mean that the device will not cause interference. This

is a fact that I believe the IEEE Power System Relaying Committee (and the FCC) agrees with, but most of the BPL proponents seem to fail to understand.

The Information Technology Industry Council states that part 15 limits “have been very effective for preventing interference from individual electronic devices...”. I disagree. The reality is that the part 15 limits have been fairly effective in preventing interference between common consumer electronics, BUT these limits are nowhere near stringent enough to protect licensed users with very sensitive receivers from interference. The current part 15 limits are too high to protect these types of sensitive receivers. This council does correctly conclude that BPL is a very different thing from the types of products previously developed under part 15 limits. BPL cannot be easily filtered, replaced, or moved in order to mitigate interference. If a BPL system causes interference to a neighborhood, the only answer is to shut it off. I recommend that BPL never be deployed in the first place since it is clear that it will generate interference in any neighborhood in which it is deployed. The only questions are: how much interference and how many people/devices will be affected?

Intellon suggests that “Additional regulation of BPL is not Needed”. I strongly disagree with this statement. In fact, the only reason that in house BPL does not interfere with licensed users is because the HomePlug alliance agreed to employ spectral masks to protect licensed users that are commonly found in residential areas (like amateur radio operators). Part 15 rules should be modified to require spectral masks in all BPL systems (access and in home) to protect licensed users and/or the rules should be modified to reduce the amount of unintentional or incidental RF radiated by these devices. Clearly, the HomePlug alliance knew of the interference potential and did something about it. This was not an FCC requirement. I urge the FCC to require BPL devices (and better yet, all Part 15 devices) to employ spectral masks and/or meet much more stringent requirements for radiation.

Phonex describes how it worked with groups such as the ARRL to limit potential interference to amateur radio stations. Phonex should be commended for recalling a particular device which generated a large amount of interference several years ago. The burden should not be placed on licensed users to find these sources of interference one-by-one and report them to the proper authorities. Instead, the burden should be on the manufacturers to more thoroughly test their products. In addition, mere adherence to the Part 15 specification does not guarantee there will be no interference. This was proven years ago with the Phonex device. The very fact that HomePlug employed spectral masks is proof that meeting the letter of the Part 15 law is insufficient. Manufacturers must do more. Manufacturers must guarantee that devices will not cause interference when installed in a “typical” neighborhood BEFORE the device is allowed to be sold. It is unacceptable to foist a device on the public and wait for licensed users to complain before doing anything about it. In the case of the Phonex device, this is exactly what happened and it was a very costly mistake. In the case of BPL, this would not only be a costly mistake but may be uncorrectable.

Powerwan states that if part 15 requirements are not relaxed, it will “pose economic impact on full deployments”. Yes, doing the right thing often costs more money. It costs more money to use solar power than gas, but it is a good thing to do. It costs more money to put safety features in cars (like air bags), but the added cost is worth it. It costs more money to provide adequate RF filtering in consumer electronics, but it is the right thing to do (in spite of the fact that most manufacturers provide inadequate shielding). I urge the FCC not to be swayed by these arguments which are really a way of saying “we won’t make enough profit if we have to protect licensed users”. Powerwan states (as have nearly all BPL proponents) that “Access field tests to date have not resulted in any complaints, either from the customer or from the customers’ neighbors”. If BPL doesn’t cause interference, then why has it been almost impossible for independent testing organizations (like the ARRL) to find out where trials are taking place and why have the BPL proponents running field trials not invited licensed users to verify this claim. If BPL proponents believe they have nothing to hide then why don’t they invite a collection of licensed users to come and do their own testing of the system. If BPL technology has nothing to hide, then why have BPL test systems been “mysteriously” shut down for “maintenance” when an ARRL official announced that he was going to be doing interference testing in the area? Licensed users have nothing against the BPL proponents. All licensed users would like to see more broadband deployment. If these systems are really as “clean” as the proponents claim then all of the licensed users will be able to go home and sleep at night knowing their fears were unwarranted. I suspect, though, that the real reason this type of testing has not been done is that companies like Powerwan are all too well aware of the level of interference they will generate and they don’t want anyone to know until it is too late. Powerwan also seems to imply that it is ok to pollute the radio spectrum because “radio services are migrating to digital technology...”. This may be true of some radio services, but not the majority of those in the HF and lower VHF bands. Many licensed users of these frequencies engage in very weak “analog” communications and these users must be protected from interference. I don’t think, for example, that Radio Astronomy will be switching to digital any time soon! Powerwan seems unconcerned about these weak signal users. If Powerwan really believed their systems didn’t cause interference, then why would they suggest that spectral masks may be necessary? The very fact that Powerwan suggests that spectral masks may be necessary suggests that they know full well that interference is likely, contrary to their earlier statements. I urge the Commission to investigate these claims and verify that these field trials are not being done in areas where there are NO licensed users and that these claims are really true. I urge the Commission to do a thorough study of these claims before any more BPL deployments.

PPL Telcom, Inc. states “For the reasons set forth below, PPL Telcom believes that BPL does not pose significant risks for unintended high frequency radiations that will impair the operation of consumer devices, amateur radio communications, or other forms of commercial communications (e.g. television, radio, mobile radio, etc.). PPL Telcom goes on to suggest that they believe that adherence to the “letter of the Part 15 law” is sufficient to guarantee that there is no interference. This has been proven time and time again to be false. The Part 15 rules are not stringent enough for this to be true. FCC Certification is not sufficient to protect other radio services.

Satius requests the Commission to allow greater radiation limits than are presently allowed under Part 15 rules. In addition, Satius requests the FCC to allow the use of frequencies > 200MHz. I am in very strong opposition to this. In fact, I urge the Commission to tighten up the Part 15 rules because the current rules allow for power levels that are already high enough to cause interference to licensed users of radio spectrum. I urge the Commission to deny any requests for even higher frequency BPL systems. I urge the Commission to do a thorough study of all BPL systems and verify that these systems do not generate harmful interference to any other devices before these systems are further deployed.

The United Power Line Council states that “broadband deployment is at an impasse that requires a disruptive technology”. To this I say: “why use a technology that would be so disruptive to existing licensed users of the HF and VHF radio spectrum”? The UPLC sums up the sentiment of ALL BPL proponents when it says “The UPLC is pleased to respond that there has been no interference reported in any of the field trials by its members”. The BPL proponents continue to run closed field tests (without inviting licensed users) and then report that their members report no interference. Well of course not. Why would a BPL proponent report interference? It would only slow the adoption of the technology. It is my belief that BPL field test areas have been hand picked to be in areas where interference reports are unlikely. It would also not surprise me at all if interference reports were “accidentally” filed away in the “circular file”. If the UPLC (and all the other BPL proponents) really believe their systems do not cause harmful interference then I suggest that they invite short wave listeners, amateur radio operators, radio astronomers, mobile radio users, etc. to the test sites to measure the interference. I urge the FCC to thoroughly investigate these broad claims and ban further deployment of BPL until harmful interference can be proven to not cause a problem in ANY neighborhood in which it is deployed.

In summary, I would like to state that all of the BPL advocacy groups have stated that they believe that meeting “the letter of the Part 15 law” is sufficient to protect licensed users from harmful interference. It should be clear to everyone by now that this is just not true. All of us can point to one or more devices which meet “the letter of the Part 15 law” yet cause interference when placed in close proximity to a licensed radio receiver. The Phonex device is a good example, as is a whole host of light dimmers and switching power supplies being sold as we speak. The only reason that interference from these devices has been tolerable is because they are not pervasive. The primary advantage of BPL (as stated by its proponents) is the fact that power lines are in every neighborhood. They run by nearly every home and business. They are...everywhere. This is the very reason why interference from a BPL system cannot be compared to that from a light dimmer or switching power supply. Once interference has entered the neighborhood you cannot do anything about it except turn it off. I urge the FCC to spend more time exploring the real interference generated by this technology and ban its deployment until such time that it can be proven to cause no harmful interference to any neighborhood in which it is deployed. If it can (and I suspect it cannot) be proven that it can coexist with amateur radio stations, short wave stations, AM broadcast receivers, military receivers,

etc. then and only then should it be reconsidered for wider deployment. I urge the FCC to do further testing of the existing field trial sites with an eye toward interference to licensed users. Once a resource has been polluted, it is difficult (if not impossible) to clean it up. We are at a crossroad. We must choose the right path. We must choose to protect the RF resource and only deploy technology which is "RF clean". I would also like to state that interference to the BPL system from licensed users is also of concern, since licensed users are always blamed for these types of problems in spite of the fact that the problem is almost always caused by susceptible consumer electronics and not the licensed transmitter. Licensed users must be protected.