Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	
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Carrier Current Systems including Broadband Over Power Line Systems	)	ET Docket No. 03-104
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	)	
Amendment of Part 15 regarding new requirements and measurement guidelines for Access Broadband over Power Line Systems	)	ET Docket No. 04-37

To: The Commission

Comments on the proposed rulemaking by

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The writer is a recently retired R&D scientist (42 years) with the past 30 specializing in photonics, electronics and optics. He also is an Amateur Radio (Extra class) of 46 years this coming August 2004 and has designed, constructed and operated equipment in the 3.5 to 450 MHz spectrum.

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I applaud the Commission for encouraging new ideas and techniques toward the goal of affordable broadband service for the people of this country. Indeed, cable and DSL are available to many but cost appears to be the main issue.. Competition could indeed drive prices down but are still not likely to reach the level of dialup ($15/month here). The choice where all are available will be decided on personal requirements and finances.

References have been made comparing broadband availability to other countries (primarily in Europe) and the United States is surely not at the top of the list. This comparison, however, must be tempered by factoring in population density. Statistics can be a highly useful tool, but is very easy to manipulate. Broadband via cable or DSL (and RF networks) is generally available in cities and for certain in metropolitan areas; similarly, public transportation. Rural, however, is a

completely different matter. It is highly unlikely that either is available on the plains of Wyoming. At my local level, both cable and DSL are available in the city but neither to me – and I am literally four (4) miles from town. It is simply a case of economics and BPL will be no different.

The call for power lines to carry broadband to the masses is interesting and does work, but is only one part of the story. The push for affordable broadband by President Bush is an admirable goal but endorsement of (specifically) BPL raises questions as to his being adequately informed of the true ramifications of the technique. It seems that he has received input from a select few.

Curiously, the BPL proponents continue to beat the drums that all is well and the pot of gold at the end of the rainbow is there for the taking. Nothing, however, could be further from the truth. It would be the wise investor or politician to do their homework before committing to this technology for if it appears to be too good to be true, it probably is. Caveat emptor!

The BPL industry (and indeed the FCC too) appear to be in a frenetic push to quickly deploy this service though many questions and concerns have yet to be addressed or solved. The media too has been visible with articles showing the merits of BPL. Unfortunately, it appears that the great majority, from a Mom & Pop newspaper to the prestigious *Wall Street Journal*, reporters have not done their homework and are taking at face value the press releases of the industry and in some cases, government. Indeed, President Bush's endorsement has spurred some in the industry to consider deployment a done deal.

Economically, this specific proposal/technique appears to have a very small window of opportunity as announcements of WiMax technology deployment with access in the 30-50Km range are expected in Q4 of this year. This window is starting to slam shut! BPL repeaters/regenerators will be required every 0.5 mile or less which amounts to a lot of expensive hardware. This fact alone negates the argument that BPL will be a boon to the boonies. At a recent meeting in Penn Yan (NY) where Data Ventures Inc. (DVI) has a trial in progress the question was asked about service to outlying areas. The representative replied that (paraphrasing): "…we never said that we would be supplying BPL to the farmers spread miles

apart. We're deploying the service in small towns and towns…" When that same representative was asked about (FCC Chairman) Powell's statement (FCC 04-29, P.34): "I am optimistic and will welcome the day when every electrical outlet will have the potential for high-speed applications to all Americans.", his comment was: "I read Chairman Powell's statements every day. He never said that." So much for industry credibility!

The industry is implying that spending money will ensure success with both delivery of the service and the elimination of interference. Indeed, Mr. Alan Shark of the Power Line Commission Association (PLCA) said in a letter to the *Wall Street Journal* (May 30) that: "…our industry has spent hundreds of millions in research and testing…" As I previously said, I was in R&D for 40+ years – money alone cannot solve all problems. All new technologies have flaws which must be addressed and solved, or the project abandoned. Such is the nature of R&D.

The real question is why even consider the use of power lines as transmission lines for radio frequencies? The only reason is the massive grid of wires across the landscape that (usually) delivers AC power to most corners of the nation. The second question is why consider the 1.7 to 80MHz spectrum as suitable? I wonder if the industry views this as "wasted space" with only parts used in a transient fashion as a playground for tinkerers, that the lower TV channels are received by most via cable thus affecting only a few, and that they could avoid those government and other special fixed services. Shortwave would be considered of little consequence for after all, many are available on the Internet via streaming audio/video or via satellite radio. There is one more possibility based on the use of the HF spectrum primarily by shortwave broadcasters and radio amateurs. The present sunspot cycle (23) is on the downside and will reach a minimum around 2006. Since the aforementioned services are well aware of natural propagation phenomena, one wonders if it was the intent to use this to advantage and use spectrum where it would be less likely to be noticed. While this is true of broadcasters, where reliable and predictable paths are necessary, that is not true for the amateur operator. As a class, they are more frequency agile and will often adjust their frequency of choice to the highest one to support propagation for it is there that maximum distances will be propagated by the ionosphere. Then too, there are the semi-annual sporadic E (Es) phenomena that can affect frequencies up to 50-60

MHz (sometimes higher) with exceedingly low loss. I submit that the BPL proponents are counting on a low level of "collateral damage".

The use of power lines in an RF transmission mode is fundamentally flawed where the usual purpose of a transmission line is to deliver maximum power to the load with minimum losses, be it at 60 Hz or 1 GHz. There is no argument that BPL has been shown to work; how well and with what consequences is a totally different matter. At best, power lines are capable of carrying RF up to, say, 300 KHz or so with minimal problems. The PLC industry has been doing this for many years in control systems for the power industry. The design of these lines is contrary to theory and sound engineering principles. As the spacing of the conductors becomes large compared to the wavelength, radiation becomes a major loss in the system. This is because the fields are no longer confined and can be seen in twisted pair telephone cable and in common TV twinlead. Also of importance is the impedance matching of a transmission required for maximum power transfer. With a mismatched load, reflections will occur and nodes or peaks/valleys can be detected. Such has been shown and discussed in the recently released NTIA Phase 1 study of BPL. Power lines, with their complex configurations, taps, transformers, insulators, arrestors, etc., thus present a highly variable mixture of conditions that are unlikely to be designed around. Modeling and measurements of simpler systems have been done by the ARRL and confirmed by the NTIA work.

Yet, with this growing mountain of evidence, the industry persists in the myth that there is no interference. Actually, to be more correct, they deny "…no harmful interference…" There have been many documented cases but turning a blind eye seems to be the orders of the day. Just what constitutes "harmful" versus "harmless"? Recently, Progress Energy, in the Raleigh trials stated that after several attempts at reducing interference, they, for all intentional purposes, met the emission levels as required by the Part 15 and that they would be the ones to determine if more work was to be done. Excuse me, but who are they to define "harmful" and to decide when they have done enough? Electric field levels are indeed specific, but in the NPRM, P.17, ¶39, states that: "…BPL would also operate under our Part 15 non-interference conditions. Thus operations must cease if harmful interference to a licensed service is caused." Again, the word

"harmful" is the ill-defined term. To me, if interference results in the inability to communicate, it is, by definition, harmful. This is also defined as such in Part 15, §15.3(m).

It is interesting that the Commission has found it necessary to even address this since BPL will operate under the auspices of an "unintentional radiator" under Parts 15, §15.3(e) and PLC communications §15.109(e) which has strict field limitations but nevertheless, must still adhere to the rules of §15.3(m). There is no question that all emissions of Part 15 devices can be completely be eliminated, but it is the nature of the interfering signal. "Unintentional" is defined as a device that generates radio frequency energy during its operation but is not intended to be radiated. As noted, PLC devices are of this nature. Thus it seems that the BPL industry is trying to rewrite the rules to allow an "intentional unintentional radiator" – an oxymoron if I ever heard one! Furthermore, the issue of "mitigation" must be raised as to the level and timing of the mitigation. To be effective, the systems must be able to be adjusted, preferably by frequency shifting to eliminate, not reduce harmful interference. For this, I again refer to §15.3(m). In the real world, this will present serious challenges to the designer of such a system and I question whether it could be done for full bands, rather than just a few selected frequencies. Of course, shifting then (potentially) simply dumps the problems into someone else's lap! For certain shortwave broadcast frequencies or government channels, this is easier since the frequencies are generally known. For amateur radio, the problem becomes harder because of the frequency and mode agility (a quality that is unique and a more efficient in spectrum usage). How is one to inform a BPL provider that a band is going to be used? Some have suggested a database where one could notify the operator 24/7 that a band needed to be cleared. Others have proposed that the repeater itself be sensitive to a signal and would move automatically upon sensing same. This brings up issues of good operating practice and potential interference while transmitting an "activation" signal. Then too, if this method is employed, what of the person who only has listening mode capabilities?

The Commission has also suggested that the operator of a licensed service reorient his antenna for minimum received interference. Unfortunately, some do not have that option as they may be space-limited, hardware limited, or limited capabilities and freedom because of local (HOA) restrictions. Furthermore, it flies in the face of radio propagation fundamentals; one does not

point an antenna north to hear a signal coming from the west. This may reduce interference, but the desired signal may also disappear. Of course if reorientating the antenna then brings another BPL source into play, it is a useless exercise. The placing of the mitigation responsibilities on the one being interfered with is an unacceptable option.

Also to be considered is the probability of spurious mixing products generated from strong signals with the BPL signals. Also to be considered is the potential for harmonic generation. These can occur at any non-linear junction, be it rusty hardware or in the BPL repeater units themselves. Such happenings may be rare, but are not unheard of and have been the subject of multi-service problems on common towers and mountain tops. The consequences are that a signal could fall on a public service/emergency or aircraft frequency. The NTIA report did indeed address the issue of upward radiation of signals form BPL activated lines.

Then, what about the BPL service customer? Will they be pleased if service is reduced or ceases because of an interference issue? Somehow, I think that "Joe America" will find that unacceptable – and in the most vocal sense. It is, therefore, imperative that customers be made fully aware, in writing (full disclosure) of the potential for limitations of service. The responsibility for loss of service must be borne by both the provider *and* the equipment manufacturer.

BPL has been proposed as an aid to homeland security and no one can deny that that security is of prime importance. Frankly, I fail to see where this, in itself, will have a major effect to aid this effort. I submit, instead, that it will have a negative effect on same by damaging the unique service capabilities of amateur radio. By the very independent nature of the service, it stands alone as not being confined by the rules of various agencies. Indeed, it has been shown to be effective as a bridging service to allow government and safety agencies to exchange information. There is action afoot to remedy this situation but will take years to complete and billions in funds. Frankly, we can't afford to wait that long. History has shown the ability and willingness of amateurs to serve when needed. It happened with the shuttle disaster; it happened with the plane crash off of Long Island; it happened with 9-11; it will happen again. These are only a few of the larger scale operations; amateurs provide countless to the public for everything from

walkathons to hurricane duty. Last summer, I heard a station – on 14 MHz trying to contact the National Hurricane Center. Why there? All commercial power and VHF/UHF links – government and amateur were out. The emergency traffic got through. Various agreements have been made with FEMA where amateur radio is considered a vital part of homeland security. If power is out, say in Philadelphia, it is likely that so will any BPL deployment so a station should be able to hear someone in, say Chicago. But what if the station in Chicago can't hear the station in Philadelphia? Are these capabilities to be compromised? The Commission, therefore, has the responsibility to protect what is a unique, natural resource that is not duplicated anywhere else.

At this time, the deployment of BPL as proposed seems ill-advised at best. It is imperative that the Commission consider whether this is the answer from Heaven as some have promoted or is a wolf in sheep's clothing. Many other techniques that are far superior are on the near horizon; WiMax from the wireless standpoint and optical fiber from a "wired" position. Both have their merits; perhaps a melding of these technologies would be an overall better solution. At minimum, the Commission needs to wait till Phase II of the NTIA study is out to make a better informed decision. The Commission bears the responsibility of deciding if the BPL approach is in the nation's best interest or is better bypassed for more forward thinking. To do otherwise could be costly – and fatal!

Respectfully submitted,

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