Before the

FEDERAL COMMUNINCATIONS COMMISSION

Washington, DC 20554

In the Matter of:

INQUIRY REGARDING CARRIER CURRENT SYSTEMS, INCLUDING BROADBAND OVER THE POWER LINE SYSTEM.

ET Docket No 03-104

Reference: Comments filed by the American Radio Relay League

To the Commission

Reply Comments by: James Andera

These comments are in support of comments filed by the American Radio Relay League (ARRL) regarding the use of power lines to distribute internet service via Broadband Power Line (BPL) technology. The ARRL's research clearly shows that BPL would be harmful to radio services that operate between 2 MHz and 80 MHz. My comments expand on several of the thoughts put forth by the ARRL.

1 Harmful to radio communications

As pointed out by the ARRL, ten amateur radio bands exist in the frequency range between 3.5 MHz and 54 MHz. Each of these ten bands exhibits unique and constantly changing propagation characteristics. These unique characteristics in turn provide amateur radio operators the ability to establish and conduct communications over various distances. Because the transmitted signals are often severely attenuated by the ionosphere (or in some cases by terrestrial obstructions) signals arriving at the receiver can be very weak. In order to allow for the reception of these weak signals, the receivers used in amateur radio communications are generally very sensitive. This sensitivity was well documented by the ARRL's report

"Calculated Levels from Broadband Over Power Line Systems and their Impact on amateur Radio Communications Circuits" Table 1.

Any significant increase of the noise level—such as a BPL signal—could render reception of weak signals impossible. Strong PBL interference would render most communications impossible on these 10 HF and low VHF amateur bands.

It is important for the Commission to realize that the ability of the amateur radio service to provide emergency communications would be adversely and seriously affected by the widespread implementation of BPL. Much of the communications conducted on the amateur radio bands, for both emergency and non-emergency communications, involve the reception of weak signals between 3.5 MHz and 54 MHz.

Due to the very nature of emergency and disaster-relief communications, low transmitter power will often be utilized to minimize the power consumption and extend battery life. Additionally, mobile antennas or temporary antennas deployed in emergency and disaster-relief communications often exhibit poor efficiency. These factors, combined with the normal ionosphere attenuation, frequently result in weak signal operation.

An increase in the noise level of 33.7 dB to 65.4 dB, as indicated by the ARRL's report, would largely destroy much of amateur radio's ability to communicate in these areas. This destructive interference has been demonstrated by the ARRL's analysis, as well as by field tests conducted by the ARRL. My experience shows the increases in the noise level of even 6 dB has harmful effects on weak signals reception.

As an active member of several amateur radio communications groups that exist to provide emergency and public-service communicates for various government and non-government, I must join the ARRL in asking the Commission to ensure that the noise level is not allowed to increase in the amateur radio bands. The amateur radio bands between 3.5 MHz and 54 MHz are an important factor in the ability of the

amateur radio community to provide emergency, disaster-relief and public-service communications. An increase in the noise level on these bands would yield a corresponding degradation in the ability of the amateur radio service to provide emergency communications over medium-distance to long-distance paths.

2 Existing Power Line Noise

The ARRL report correctly points out that power line interference has historically been a problem in radio communications. In the course of dealing with my local power companies on line-noise issues, I have experienced the following:

- Radio-frequency-interference problems are generally a low priority with power companies.
- Power companies do not proactively work to monitor or eliminate interference—they only respond to complaints.
- My local utility company lacks the proper equipment to locate the sources of interference.
- Power companies are understandably reluctant to take lines out of service to perform required maintenance.

These factors result in interference problems that are slow to be resolved—or that may never be adequately resolved. As an example, at this time I am experiencing severe power line interference that has been plagued me for five months, with no resolution in sight. This interference has already been disruptive of disaster-relief communications in the aftermath of tornado activity that stuck Kansas in May of this year and continues to be disruptive of emergency-communications-preparedness activities on a daily basis.

In my own community, 70% to 80% of the areas with overhead power lines are plagued with significant line noise interference. This widespread interference ranges in intensity from moderate to extremely severe, indicating that many poor electrical connections and-or leaky insulators exist as sources of this interference. The problem extends well beyond my local community. As I drive along overhead power lines in communities across the Midwestern U.S. monitoring radios frequencies between 3.5 MHz and 54 MHz, I observe significant levels of interference on approximately 50% of the lines. It is obvious that

power companies have difficulty in maintaining their lines to ensure that they do not generate harmful interference. There is no reason to believe that power companies would be any more successful in controlling BPL-related interference.

3 Exclusion Bands

The ARRL report points to the need for access-BPL to provide exclusion bands on the amateur radio frequencies, similar to what has been done with in-house BPL. One obvious limitation of the exclusion band approach, as the ARRL correctly states, is that this does not provide relief for future amateur band allocations.

There is still another concern with regard to relying on exclusion bands to mitigate interference between BPL and radio communications. This concern relates to the issue of intermodulaton distortion (IMD). IMD has the ability to generate products that would fall into the exclusion bands, even if the original signal applied to the line did not include significant amounts of spurious energy. The ARRL report again correctly states that "Even if Amateur spectrum is avoided, the spurious and out-of-band emissions from BPL systems operating on adjacent spectrum must be deeply suppressed."

IMD would be a difficult-to-control form of spurious emission. Loose electrical connections, connections made with dissimilar metals, or leaky insulators can inject a non-linearity into the system. These non-linearites will produce IMD products that "fill in" the exclusion band.

Table 1 documents a laboratory simulation of this IMD effect. For the purpose of this test, an exclusion band was set up around the 20-meter amateur band. The exclusion included an approximately 50 kHz guard band on either side of the 14.00 MHz to 14.35 MHz amateur allocation. On either side of this exclusion band were simulated broadband signals. With a relatively clean system, the energy in the exclusion band is suppressed typically 65 dB reference to the level of the desired broadband signal. When

a non-linearity is added in the system, the signal level in the exclusion band increased an average of 30 dB. As such, the effectiveness if the exclusion band is greatly diminished, resulting in an increased interference potential on the frequencies in the exclusion band.

Configuration	Average Attenuation in the Exclusion Band
Clean broadband signal with exclusion band	65 dB
Broadband signal with a nonlinear element inserted	35 dB

Table 1 Simulated Exclusion Band

This 30 dB increase is observed with only a single non-linear element added. Based upon the observations I have made of the widespread nature of power line interference, non-linearties in the power line systems appear to be rampant. Each poor connections or leaky insulator can add to the IMD, further increasing the interference that falls into the exclusion band. As such, there is an extremely high risk that that exclusion bands will in many cases not be very effective in mitigating the access-BPL interference to amateur radio operations.

4 Conclusion

The concept of expanded Power Line Carrier systems at HF and low-band VHF is technically not compatible with radio communications in the same frequency ranges. The detrimental effects that BPL would have to radio communicates—including emergency and public service communications—has been demonstrated by both field tests and analysis. Even well intended measures to control the BPL interference to radio services operating in the 2 MHz to 80 MHz spectrum would be largely ineffective. Such factors as IMD, poor power line maintenance, and the very concept of trying to operate a non-shield and poorly balanced system as a RF delivery system would not be in the public interest. A variety of other technologies already exist to distribute internet services that minimize the risk to radio communications. The risks associated with the BPL approach clearly outweigh the potential benefits. I join the ARRL in requesting that the Commission take no steps to permit Access BPL at HF or VHF at this time.

Respectfully submitted by

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