Reply Comments
with respect to
ET Docket 03-104

Comments concerning replies the FCC has received for Proceeding 03-104 are provided for your consideration. Particular comments are provided for the responses of Ameren Energy Communications Inc. (AEC) and Florida Power and Light Company (FPL).

As you are well aware, the majority of the replies provided to the FCC concerning its NOI on BPL technology do not contain quantitative technical information to substantiate their recommendations. However, recent tests conducted by the Amateur Radio community negate the claims by BPL proponents that BPL systems don't generate significant levels of unintentional radiation. This has caused several organizations with in the Defense community to be concerned.

BPL technology is of particular interest because of its potential detrimental affect on the tactical communications radios used by all the US Armed Services in their Command Control, Communications and Intelligence (C3I) Systems. For these systems US Army Contractors constantly have to consider both intentional and unintentional transmission in the range of 2 to 80 MHz. Clearly any wideband BPL signal received at an antenna of a tactical communications system could be classified as the equivalent of noise jamming by the armed services. C3I radios now use low power spread spectrum techniques to minimize their electronic signature and avoid detection by the enemy.

The effect of noise jamming on these systems is often documented in classified documents. Existing wideband data systems use low-power, line of site radios or limited ERP in the GHz range or use coaxial and shielded twisted pair transmission lines to prevent such interference. Information provided in the comments provided to FCC lack quantitative information or is often technically flawed; therefore it will be very difficult for the Services to comment on the impact BPL would have on their communications, stateside or world wide.

FPL (page 8) states that "BPL vendors have demonstrated sincere efforts to insure that their technology, provisioned as an unintentional radiator, does not interfere with FCC-regulated radio bands and will meet FCC Part 15 requirements." Their statement that the technology does not interfere with FCC regulated radio bands is contrary to sited interference documented in comments filed on this NOI by companies who made equipment and conducted field trials. For example, AEC on page 13 states "Some emissions above the Part 15 limits were observed between 2 and 30 Mhz…" The AEC report addresses the fact that radiation levels are difficult to predict and "suggests that the commercial deployment of BPL is unlikely to cause interference to its users or third parties" AEC did not state what levels would cause interference nor did they state what levels they generated.

The NOI queried whether models exist to predict radiated emissions from Access BPL systems. AEC stated (page 11) "Although such models do exist, AEC believes them to

be of little practical benefit." Existing wideband technology, such as the internet, uses transmission line that have controlled impedances and shielding characteristics. Power line high frequency characteristics are difficult to model because the physical configuration (e.g., spacing, length, orientation etc.) changes significantly through the wire network. They also state that "Finite element models are generally very accurate, but are preliminary research tools not planning tools. This is because a prohibitive complexity is required to calculate the radiated fields from an extensive Access BPL network using the finite element method."

The US Government developed software to predict the radiation from wire elements using this method years ago. The basic software engine (NEC 2) is in the public domain with a more complex engine (NEC 4) available for a small licensing fee. Several commercial businesses have developed programs that use these engines. These programs are used everyday to design commercial antennas and predict emission levels. The science implemented by these programs is very sound, accurate and taught at the undergraduate level. While the number of segments (elements) may not currently support physically large (tens of miles) networks they are proper to use to determine the radiation from significant portions of the network. These engines also run on PCs and can be expanded as the computer power is increased. A wire that is 300 meters long has over 10 dBi of gain at 30 MHz.

The fact that companies are saying that the "technology is not there' and that models are not available is incorrect. The main reason they don't want to use models is the results will show that in the range of 2 to 80 MHz power lines act as antennas with gain. This gain can easily increase the BPL signals to levels above the limits of Part 15. AEC did not specify how far above the part 15 limits there signals were. Part 15 should be amended to include any gain that may be attributed to the transmission media. Having a device meet Part 15 is proper, but it must also apply to the entire system which includes the transmission line system.

AEC did not address the signal levels that would be generated using ground wave nor sky wave propagation. Nor did they explain what technology was being used to prevent existing users of these frequencies from interfering with their equipment. Power lines act as receiving antennas with gain just as they act as transmitting antennas with gain.

The author has spent a significant amount of time deploying military equipment that has been tested both for radiated and conducted emissions and susceptibility. The use of broad band BPL signals at levels that do not interfere with licensed users of these frequencies will make the BPL receive system (high receive sensitivity) susceptible to signals generated by other licensed users of these bands. These licensed users use significant power to communicate using sky wave propagation below 30 MHz.

The sensitivity used in BPL receivers will make them susceptible to overload by both in band and out of band radiation. One would need a large dynamic range and adaptable selective filtering to cope with this inevitable reception of signals. At these frequencies, filtering components are large compared to integrated circuits. BPL technology is

therefore limited from benefiting from miniaturization. The cost of production equipment could be prohibitive. FPL states that they believe "that BPL benefits customers and offers an attractive business proposition both to the utility and other market participants. The use of expensive large receiving terminals will not result in an "attractive business proposition".

Summary:
The following is a summary of the above as it pertains to the NOI.

1. Existing Part 15 rules are not adequate to protect authorized users of the proposed spectrum. The FCC should modify Part 15 limits to control emissions levels of the power lines and consider the entire system, not just the devices themselves. It will likely be necessary to reduce existing Part 15 emission levels to prevent interference with licensed users of these frequencies. More analysis and testing are required before specific levels can be recommended.

2. BPL emissions should be limited in bandwidth and range of frequencies. The frequencies should be select to preclude skywave propagation. Specific frequencies should be assigned that are not used by the military, amateur radio or public service organizations.

3. BPL technology offers a high risk to interference when compared to new line of sight technology currently used by unlicensed devices. New technologies in the GHz frequency bands use transmission lines and equipment that control emissions. BPL technology can not rely on the power network to be consistent and controllable.

4. FCC rules should be changed to specify a standard that can be used to measure the emission levels of the system. Existing military standards or new IEEE standards can be used as guides for measurement once emission levels are defined. Companies have been measuring these parameters for years and have standard procedures and equipment.

5. The FCC should require operators to measure the deployed system emission levels and certify, through an independent organization, that they are in compliance. Fines should be levied for noncompliance.

6. The deployment of BPL equipment that interferes with licensed users could result in many law suits.

Regards

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