Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Inquiry Regarding Carrier Current	)	ET Docket No. 03-104
Systems, Including Broadband over	)	
Power Line Systems	)	

TO: THE COMMISSION

COMMENTS OF AMEREN ENERGY COMMUNICATIONS INC.

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SUMMARY

As the Commission endeavors to define the technical parameters that will govern the provision of broadband over power lines ("BPL"), it must ensure that it does not inhibit this promising technology with overly-restrictive rules and regulations. Moreover, the Commission should strive for maximum flexibility, imposing restrictions only where shown to be necessary. To that end, Ameren Energy Communications, Inc. ("AEC") 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.

By focusing on actual tests of BPL, and not on theory, the Commission will be able to answer many of the questions it has posed in its proceeding. For example, AEC's test results show that the Commission need not designate frequencies for separate use by In-House and Access BPL. Similarly, the Commission should find, as AEC has, that BPL systems do not pose an interference risk to licensed radio users, cable and telephony systems, or to neighboring homes or apartments of BPL users. AEC's tests also show that a radiated emission standard is preferable to one based on conducted emission limits, as a means to prevent interference.

AEC's experience also illustrates the need for standardization in equipment and measurement methods. Standardized equipment will help the industry to deploy more cost effective systems, and will permit users to acquire more affordable BPL devices and hardware. Standardization of measurement methods, meanwhile, would benefit the entire BPL industry by providing stability and predictability to issues of interference correction, product manufacture, and system deployment.

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Ameren Energy Communications Inc. ("AEC"), an exempt telecommunications company under the Puiblic Utility Holding Company Act and a subsidiary of Ameren Corporation, by its counsel, and pursuant to Section 1.415 of the Commission's Rules, 47 C.F.R. § 1.415, hereby submits comments in response to the above-referenced Notice of Inquiry ("*NOI*"). In this proceeding, the Commission has asked for comment regarding dozens of technical issues related to the provision of communications over electric power lines, which the Commission has called Broadband over Power Lines or BPL. AEC offers herein its suggestions as to how the Commission may best promote this promising power line communications technology.

INTRODUCTION

In June of 2002, AEC received an experimental license to deploy a limited, experimental BPL system in Cape Girardeau, Missouri, a southeastern-Missouri town of approximately 35,000 people.[1] To date, the BPL network passes approximately 300 homes and consists of five cells. Each cell is comprised of a group of homes served by a backhaul connection point, in this case a T-1 line. Each cell consists of a BPL modem at the backhaul connection point, BPL modems acting as repeaters at points between the backhaul connection point and the end user, and a BPL modem located within the end user's premises, which is plugged into a wall outlet and connected to the user's personal computer via an Ethernet cable.

Although the five cells represent a test network, from a technical and operational standpoint, the system is operated in the same manner as would a commercial system. The system, therefore, is representative of a typical installation as required by Section 15.31 of the Commission's Rules.[2]

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[1] WC2XXK, File No. 0093-EX-PL-2002.
[2] 47 C.F.R. § 15.31.

COMMENTS

AEC does not endeavor to answer every question the Commission has posed in its *NOI* in this proceeding. Given its experience in the BPL field, however, AEC believes it can offer considerable insight into several concerns the Commission has expressed in the *NOI*. To this end, AEC has attempted herein to answer many of the Commission's technical concerns regarding BPL systems.[3]

I. Access BPL Systems

A. Spectrum Sharing Between Access BPL and In-House BPL

The Commission has posed several questions regarding Access BPL systems, including whether there are any frequency sharing issues to be considered, and, specifically, whether Access BPL and In-House BPL may share spectrum. *NOI* ¶ 15. AEC believes that Access and In-House BPL systems should be able to share spectrum, subject to modification by the utility deploying the system.

Conducted emissions from Access BPL can enter a residence and thus interfere with an In-House apparatus operating in the same or in an overlapping spectrum. Conversely, conducted emissions from an In-House system may interfere with an Access cell situated in the residence's vicinity. The path attenuation, which reduces the magnitude of the radio frequency ("RF") signals traveling between the two systems, may not be sufficient to prevent interference. On the other hand, the distribution transformer impedance inherently inserted between the high voltage power lines and the residence lines has a varying effect with respect to impeding such emissions. Due to the stray capacitance between the transformer turns and the transformer tank, the transformer impedance exhibits a number of resonances and antiresonances at high frequencies. Resonance represents a high impedance path tending to block currents entering from one system into the other; thus, it contributes in reducing interference. The effect of antiresonance is the opposite, as it represents a low impedance path between the two systems. Experimental data have demonstrated the resonant behavior of the distribution transformer impedance at high frequencies.

The experimental system used by AEC uses signal repeaters at a residence, which effectively couple the house and the line signals. As a result, the overhead network operates at a very low signal strength, which mitigates any interference. Thus, residences that use In-House BPL, but that do not subscribe to Access BPL (and do not utilize the repeaters), are unlikely to experience interference. In AEC's experience, no interference between the In-House and Access systems has developed. Therefore, AEC does not believe that the Commission needs to designate frequencies for one use or another. Should interference develop, the deploying utility would be able to make appropriate modifications.

B. Symmetry of Data Transmission Speeds

The *NOI* seeks information regarding the data transmission speeds Access BPL can achieve, and, specifically, whether the speeds will be symmetric in the transmit and receive directions. *NOI* ¶ 15. AEC's research indicates that, dependent upon several factors, speeds generally will be symmetrical.

Data transmission speeds are determined by several factors, including: modulation scheme and modulation frequencies; channel noise and signal-to-noise ratio; and channel properties including existence of multiple paths, attenuation, distortion and frequency dispersion, and resonances and antiresonances formed by the channel components (lines, transformers, capacitors and other apparatuses). Even though the first two factors can act symmetrically with respect to the transmit and receive directions, the channel properties for the type of channel

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[3] Where possible, AEC has answered the Commission's questions in the order posed in the *NOI*.

supported by an Access BPL system are generally not symmetric. If, therefore, significant differences in the channel properties exist between the receive and transmit directions, different speeds can be experienced. In AEC's experience, transmit speeds have been competitive with other broadband services in terms of speed and symmetry.

C. International and Domestic Standardization

The *NOI* seeks information regarding international standardization efforts that may be useful to the Commission as it develops its own standards. *NOI* ¶ 20. Power line communications systems have been deployed or are under experiment in at least ten other nations, including: Germany, Spain, France, Sweden, Switzerland, Iceland, Chile, Turkey, Australia, Brazil, and Japan.[4] Several foreign bodies, including the International Special Committee on Radio Interference ("CISPR"), the Telecommunication Standardization Sector of the International Telecommunication Union ("ITU-T") and the European Telecommunications Standards Institute ("ETSI") have begun to draft and implement standards for use in conjunction with BPL-type systems.

Domestically, the Institute of Electrical and Electronics Engineers ("IEEE"), which develops standards and benchmarks of electrical and electronics systems, is engaged in the study of BPL systems under the jurisdiction of the Power Systems Communication Committee (a group under the Power Engineering Society of IEEE). IEEE is following developments by CISPR and is working for the adaptation of the CISPR standards to domestic systems.

Where appropriate, AEC encourages both the domestic and international standardization of rules and equipment specifications. Standardization will enable both the companies providing the service, as well as the customers receiving the service, to acquire mass-produced equipment and devices that are generally less expensive than custom made equipment. Such reductions in prices should help reduce the costs to consumers of commercial BPL, and help spur its growth as a competitor for broadband services.

II. Interference from BPL Emissions

A. High-pass Filter Circuits

As the Commission notes correctly in the *NOI*, Access BPL systems use high-pass filter circuits to bypass the distribution transformer and its low-bandwidth characteristics. *NOI* ¶ 20. AEC agrees with the Commission that devices that rely on the distribution transformer for high frequency isolation may be affected adversely by passive high-pass filters tuned within the device spectrum range. AEC believes the problem can be mitigated, however, if the design philosophy employs the use of signal repeaters situated at the transformer. This method is currently used successfully by AEC's experimental Access BPL.

Because the repeater effectively amplifies the RF signals, a high-pass filter with high attenuation characteristics can be tolerated. In many instances, AEC found a specially designed high-pass filter was unnecessary because the signals could travel through the transformer with a relatively small attenuation. Thus, although the repeater conveys Access communication signals between the two sides, it does not affect the impedance of the transformer, thereby preserving any inherent blocking properties the transformer may possess at high frequencies.

B. Signal Injection

The Commission has asked in the *NOI* for guidance regarding signal injection into medium voltage lines. *NOI* ¶ 20. RF signal injection to high voltage lines is divided into two parts: a coupling mechanism by which signals are conveyed from the RF source (*e.g.*, a modem)

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[4] *See* Ben Schiller, "Long Record of False Starts: Powerline Technology," FINANCIAL TIMES (Mar. 20, 2002) p. 2. The article discusses economic troubles certain companies offering the technology have suffered, but does not claim

to the line conductors and reversely; and the injection pattern or scheme, which refers to the relative magnitude and polarity (direction) of the RF signals among the line conductors. The presence of high line voltage precludes galvanic (direct contact) coupling to the line. Therefore, the method by which signals are coupled to the line must be one of two types: either magnetic induction or capacitive (electric field) induction.

The pattern RF signals that are injected among the line conductors may also vary between systems. A line segment of an overhead distribution feeder consists of a varying number of conductors. Typically, the main feeder has four conductors: three phases and one neutral. The minimum number of conductors on a segment is two: one phase and one neutral. An RF signal may be injected into some or all of the available conductors (including the neutral) at the location of injection. AEC uses the latter approach.

AEC suggests that four principles should guide the Commission with regard to RF signal injection onto line conductors and the emitted field. First, coupling an RF signal onto the line conductors creates a transverse electromagnetic ("TEM") wave that is subsequently guided by the line geometry. Other transverse electric and transverse magnetic propagation modes may also appear. Their relative magnitude, however, is expected to be comparatively small for frequencies below 100 MHz. A TEM wave propagates in the line using a combination of independent patterns called TEM modes. Each mode has its own attenuation and propagation-speed characteristics.

Second, a line above the ground plane can support as many TEM modes as the number of its conductors. The properties of some of the modes may be strongly influenced by the properties of the ground below the line. For example, a four conductor overhead line supports four TEM modes. Two of these modes are strongly influenced by the ground properties (often

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that technological difficulties or interference issues have slowed the deployment of power line communications.

referred to as the ground modes) and the other two are insensitive to it (referred to as aerial modes). The ground modes exhibit very high attenuation between 1 and 20 MHz. The attenuation of the aerial modes, by contrast, is significantly lower.

Third, the relative magnitude of each TEM mode propagating in the line depends strongly on the relative magnitude of the RF signal on each line conductor at the point of signal coupling. Coupling schemes resulting in the same signal magnitude and polarity on the conductors tend to create common mode currents on the line and, thus, they tend to excite the ground modes causing higher signal attenuation. By contrast, coupling schemes that balance the current among the line conductors tend to excite mostly the aerial modes. This mechanism of propagation also has been demonstrated by practical results on AEC's experimental system, where the best channel performance has been observed with a balanced coupling scheme.

Fourth, radiation patterns and magnitudes vary significantly with respect to the type and magnitude of the TEM modes resulting from a particular coupling scheme. Figure 1 below shows the theoretically calculated radiation pattern for a 60 m four-conductor overhead distribution line excited by an aerial mode at 30 MHz. Figure 2 shows the radiation pattern for the same line, but excited by a ground mode at the same frequency. Comparison of the two studies shows the tendency of the ground mode to produce higher radiated emissions. This conclusion is further supported by experimental measurements reported in the literature. In a real system, radiation patterns may be far more complex, as several lines running in different directions contribute to the field.

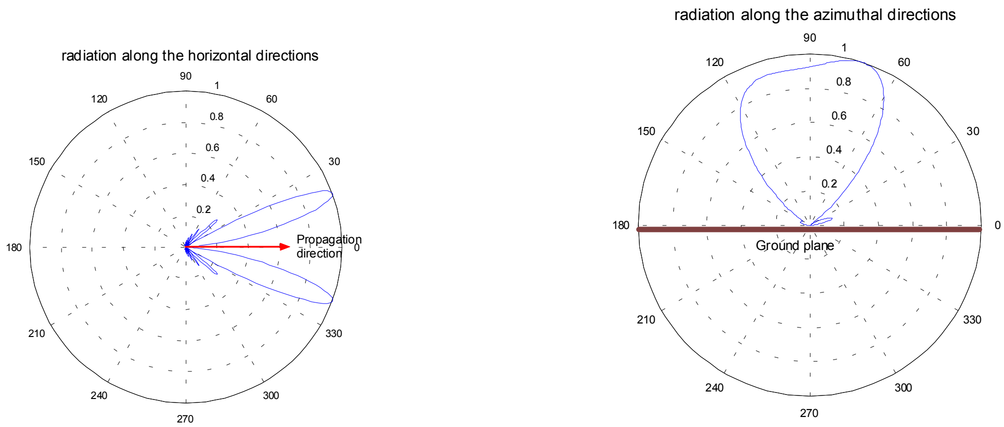

Fig. 1: Radiation patterns: Injection of an aerial mode.

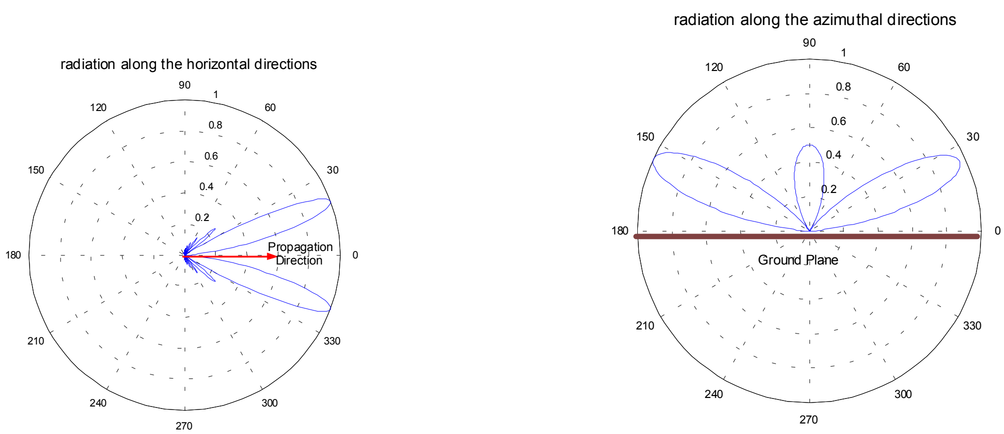

Fig. 2: Radiation patterns: Injection of a ground mode.

C. Interference Mitigation Techniques

A fundamental concern of the Commission must be the extent to which BPL systems interfere with other users of spectrum, especially public safety users and other members of critical infrastructure industries. AEC has not had a single reported instance of interference in relation to its BPL technical trial, which runs by approximately 300 homes.

As a general matter, one of the most basic ways to avoid interference with other licensed spectrum users is to design digital filters with programmable notches that permit the BPL system to avoid certain bands. Modulation techniques such as orthogonal frequency division multiplexing ("OFDM") may be more suitable than spread spectrum techniques for such schemes.

In the *NOI*, the Commission has asked what effect the presence of Access BPL equipment will have on cable television and telecommunications equipment, which are theoretically susceptible to RF signals flowing in the juxtaposed power line. *NOI* ¶ 20. Given the relatively large wavelength of these signals compared to the cross-sectional dimensions of cable and telephony cables, the induced interference is expected to consist of (practically) only common mode signals referenced to the ground, and of (practically) zero differential mode signals.[5]

Several other considerations militate against the notion that BPL systems will harm unduly cable or telephony systems. First, the BPL spectrum does not overlap with the cable or telephony spectra. Second, considerable noise already is indigenous in the vicinity of the power lines existing independently of the BPL operation, and this noise does not cause harmful interference. Third, the experimental BPL system in operation by AEC in Cape Girardeau, Missouri, which uses a spectrum up to 20 MHz, has resulted in no such interference.

If the Commission endeavors to determine further the issue of interference with cable and telephony, to provide practical data, it must measure directly the amount of induced signals on the cable and telephony equipment. Such tests should be conducted on customer premises for customers who subscribe and use BPL and those who do not. In AEC's experience, no noticeable difference has been detected between the two.

Finally, the Commission has inquired as to the interference caused by telephony and cable to BPL. AEC believes such interference to be insignificant because, for practical purposes, only common mode signals can be mutually induced between power lines on one side and cable and telephony cables on the other.

D. Emissions Models

The *NOI* queries whether models exist to predict radiated emissions from Access BPL systems. *NOI* ¶ 20. Although such models do exist, AEC believes them to be of little practical benefit.

1. Analytical Models

Certain analytical models calculate the emitted fields from broadband signal transmission. These models assume rather ideal conditions and neglect several important practical issues that may affect radiation. First, such models neglect the non-uniformity of line spatial properties and the non-uniformity and variability of the ground properties. Second, the radiated emissions are entirely assessed on the TEM modes. Third, probable secondary emissions from on-line apparatus and grounding wires are not assessed into the radiated fields. Fourth, interference from the environment (such as buildings) is ignored. Finally, application of these models also requires knowledge of the frequency behavior of on-line equipment such as transformers and capacitors, which can be obtained experimentally, but with a considerable statistical variance of the model parameters.

Although these analytical models can be applied to fairly complex Access BPL networks, given the drawbacks noted above, such models will yield only an approximation of the expected field emissions. Thus, although the models may serve as a rough planning tool for deployment of an Access BPL system, AEC is unaware of any practical data that validate these analytical

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[5] The latter is an optimistic result, because, if unmitigated, differential mode signals could be the source of harmful interference. On the other hand, without any additional mitigation, the common mode signals could be fully or

models or their accuracy.

2. Numerical Models

Another class of models are numerical models, which are based on the finite element method. Finite element models are generally very accurate, but they are primarily research tools, not planning tools. This is because a prohibitive computational complexity is required to calculate the radiated fields from an extensive Access BPL network using the finite element method.

E. Field Trials

The Commission's best evidence as to the interference issue should come from field trials of entities that have deployed BPL systems, and not from parties who rely unduly upon models like those discounted above. Only field trials can provide the Commission with real world issues and solutions. Given this reality, AEC is pleased to offer a brief synopsis of its own trial.

The AEC system in Cape Girardeau consists of five cells capable of serving a total of 300 residences. Approximately two thirds of the system facilities are deployed on the 12.47 kV overhead network and one third on the underground network. The BPL modems utilize a spread spectrum modulation technique transmitting in the range between 1 MHz and 20 MHz. These five cells provide five representative installations. In addition, the overall system has a sufficiently large complexity to allow for the validation and generalization of any test conclusions for multi-cell BPL networks. From an emissions and interference standpoint, operations thus far have been entirely positive.

AEC has recently begun an array of tests to determine ambient emissions from that experimental system. The system tested was a 45-acre portion of the 12.47 kV overhead power lines, which hosts an autonomous, experimental Access-BPL cell. The cell serves 14 residential

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partially filtered out by the common-mode rejection capability of the receiving apparatus (cable and telephone).

users of BPL. The tests measured the 30s-peak emissions at various locations in the cell geographical area including close proximity to the power lines. Filed with the Commission in June of 2003, the test conclusions may be summarized as follows:

- No BPL emissions exceeding Part 15 of the Commission's Rules were detected above 30 MHz.
- Some emissions above the Part 15 limits were observed between 2 and 30 MHz, which were probably caused by BPL transmissions. Most of these field emissions occurred in proximity to the lines, *i.e.,* within 20 meters. *Measurements at further distances from the lines indicated a rapidly decreasing field.* No appreciable emissions were detected at distances beyond 200 meters from the lines.
- No emissions above the Part 15 limits were observed outside the geographical area of the cell.
- AEC has not received any complaints of interference from test participants or third parties during the time the experimental BPL has operated, which suggests that the commercial deployment of BPL is unlikely to cause interference to its users or third parties.

F. Neighbor Interference

In the *NOI*, the Commission has asked whether increased emissions for In-House systems would pose interference problems for neighboring houses or apartments, which might share the same distribution by the RF signal. *NOI* ¶ 20. Certainly, In-House systems can transmit RF signals through conducted emissions into other residences that are connected to the same low-voltage node. The potential of such interference, however, depends considerably on the attenuation that the RF signals receive along the conduction path between the two residences. The level of such attenuation can vary significantly. In AEC's experience, BPL systems have not interfered with neighboring communications devices.

G. Emission Limits

The *NOI* asks whether Part 15 of the Commission's Rules should specify radiated emission limits as well as conducted emission limits for BPL systems or whether one would be sufficient.

NOI ¶ 20. Further, the NOI asks whether conducted emission limits would be the most appropriate. AEC supports the use of a radiated emission limit.

A conducted emission limit is designed to limit the RF energy coupled from a device onto a medium that has the ability to convert that energy into a radiating electromagnetic field. Therefore, if the receiving medium acts solely as an antenna, limiting the conducted emissions will also limit the radiated emissions. Utility power lines, whether overhead or underground, as well as house power lines, however, do not act solely as antennas. Rather, RF signals propagate in the power lines as guided waves. Thus, the line radiates only a small portion of the total injected energy. Most of the injected energy dissipates as a result of the ground and line-conductor ohmic losses, which have a considerable magnitude at high frequencies.

The strength of the radiated field from a power line is determined by the current magnitude and its distribution profile on the line. Current distribution on power lines is a complex phenomenon that it is, in turn, determined by the multi-path propagation of the RF signals and the non-uniform properties of the line (including the on-line equipment). Even though the radiated profile can be approximately predicted for a particular line, no relation that could apply generally can be found between the conducted emissions measured at the injection point (coupling point) and the radiated emissions from the line. The latter exhibit a considerable variation.

Thus, conducted emission limits may unnecessarily limit the RF energy injected into the line by BPL equipment and, therefore, the ability of the BPL system to function efficiently, without protecting other users.[6] This conclusion is supported by the European Commission's Radio Spectrum Committee, whose report "Broadband Communication Through Power Lines," states: "it would seem appropriate to consider adopting an interference model based on radiated measurements, made on an open field site and performed at different installations that can be demonstrated to be representative of typical installation sites." Appendix A at 6-7.

III. Measurement Methods

A. Standardized Measures

The Commission has posed several questions related to the need and appropriateness of standardized methods to measure BPL emissions both from Access and In-House BPL systems. *NOI* ¶ 23. As described more fully below, AEC supports standardized measures. AEC suggests, however, that because standardization measures proposed and eventually adopted by the Commission will be integral to the development of BPL technology, the Commission must permit such standards to be developed by a technical standards committee representing various interested parties.

Currently, AEC is conducting radiated emission tests in its experimental BPL site, which, in addition to achieving Commission compliance, also help AEC to better understand the mechanisms of radiation from the power lines and to refine its measurement procedures. AEC uses a grid-scanning approach, which spans a grid inside the geographical area of the BPL in order to map radiated emissions from the BPL. This is a comprehensive but time consuming approach. AEC recognizes, therefore, that a standardized approach would be beneficial to its operations as well as to the entire industry.

AEC encountered two main issues during its measurements, which the Commission should address as it proposes a standard. First, measurements should be done at distances avoiding the reactive near field region around the line. Generally, it is difficult to distinguish

[6] BPL equipment can be built with sufficient sophistication including adaptive modulation and filtering algorithms as to be able to notch out bands that, during the system operation, become a source of (radiated) interference to other

between BPL and background emissions in 10 m or less from the line. Therefore, any procedures that will require close distance measurements are likely to be time consuming and unreliable. The preliminary tests showed no appreciable BPL emission in distances of 200 m or more away from a line.

Second, extrapolation factors are necessary when the measurement distances required by standards cannot be practically achieved. The extrapolation factors used currently are based on the assumption of a point source. Given that the power lines do not act as point sources, different factors must be applied.

If developed carefully, standardized methods for testing in a laboratory or an open-area test site should hold promise. The critical first step in this direction must be the development of benchmarks for the hosting overhead, underground, and In-House networks. These benchmarks should include network configurations and sizes accepted by the consensus of appropriate technical committees as being typical with respect to radiated emissions.

The greatest obstacle in developing standardized testing likely will be the statistical variability of both Access and In-House BPL. Several items, which contribute to system variability, must be considered in developing appropriate benchmarks for Access BPL hosted by overhead lines. First, the number of line spans included in the network must be considered because the RF signals decay considerably. Second, the number and type of junctions between main and lateral lines must be considered because they control the multi-path property. Finally, on-line equipment such as transformers and capacitors must be factored because they determine the propagation characteristics of the line.

B. Testing

The Commission has asked how standardized testing would work. *NOI* ¶ 23. Typically,

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users.

a line impedance stabilization network ("LISN") is inserted between the power line and the power terminals of an apparatus enabling the measurement of conducted emissions. In the case of Access equipment, the LISN would be applied directly at the communication port of the apparatus, emulating the network impedance. The use of a LISN for both Access and In-House systems relies on the assumption that conducted emissions are sufficient to prevent interference or limit radiated emissions. As mentioned above, conducted and radiated emissions do not correlate in the case of BPL systems due to the hosting network complexity and variability.

The development of a LISN that emulates the impedance of a benchmark hosting network in a given frequency range, on the other hand, could be more useable. If, for example, a typical overhead network can be defined concerning standardized emission testing, the RF properties of that network can be readily measured and the following can be derived: (a) a LISN from the impedance of the network; and (b) an emission relation for the network relating conducted to radiated emissions. Using the LISN and the associated network emission relation, the currents injected to the line by BPL equipment could be quantified and their potential for producing harmful radiation could be predicted. The considerable statistical variability of the hosting network for both Access and In-House systems, however, may render the outcomes of such LISN as only preliminary.

C. Common v. Differential Mode

The *NOI* poses several questions regarding common mode, defined as phase neutral to an RF ground, and a differential mode, defined as phase to neutral. *NOI* ¶ 23. AEC believes that the injection of a common mode and a differential mode signal should yield significantly different values of radiated emissions.

Residential power lines commonly consist of three conductors (two phases and one neutral). Common mode signals can be created between any number of these conductors and a reference plane, or between any two conductors and the third. Common mode signals can cause current loops through the residence lines contributing significantly to radiation. By contrast, radiation contributed by differential conduction is expected to be considerably lower because of the close proximity of the house line-conductors resulting in their opposite-directed currents canceling the far fields.

The Commission notes that "[e]xisting literature is inconclusive on the degree of difference in radiated emissions from houses and buildings when In-House PLC signals are injected in common mode (phase/neutral to an RF ground) versus differential mode (phase to neutral)." *NOI* ¶ 23. One explanation as to this reported inconclusiveness concerning common vs. differential mode radiation strengths is the process of mode conversion that can take place at a significant degree inside residential premises. Mode conversion results when a propagating TEM wave meets a discontinuity in the line (*e.g.*, a junction, a load, etc.). Because several such discontinuities exist in a residence, part of a differential signal can convert to common mode and vice-versa, thereby tending to decrease the different impact between the two modes.

The Commission also asks "[a]lternatively, should a LISN be defined to simultaneously measure the total effect of the common-mode and differential-mode contributions in proportion to their expected respective contributions to radiated emissions?" and, "[w]hat should be the characteristics of that LISN?" *NOI* ¶ 23. In view of the above, before determining the role of a LISN in establishing the contribution proportion of each mode or applying differential limits, extensive tests should be conducted to help understand and quantify the propagation of signals in a residence.

IV. Equipment Authorization Process

A. Interference with Licensed Radio Services

In AEC's experience, BPL equipment has not posed an interference risk to licensed radio services. As noted above, preliminary measurements on the experimental Access BPL system operated by AEC showed no appreciable emissions away from the power lines. In addition, the experimental operation of the AEC BPL system has resulted in no complaints. Even if interference should manifest, AEC would implement the use of sophisticated equipment filters that would notch out areas of interference.

B. Component Equipment Authorization

The Commission has asked what components of a BPL system should be subject to equipment authorization. *NOI* ¶ 26. AEC believes that certain components necessary to establish Access BPL, and which contribute to radiation at different degrees, should be subject to equipment authorization procedures, such as the RF coupler, which conveys signals between an Access device (*e.g.* a modem) and the power line.

Access BPL should not be treated as a point source. Thus, testing of only a partial assembly of the equipment components (*e.g.*, only the couplers) may be deficient in that the authorized component may produce higher radiation when connected to the line, thus, not sufficing to protect other users, and conversely, the rejected component may produce less radiation, hence being rejected unfairly. Therefore, any Access equipment authorization procedure should consider all system components as they operate together.

CONCLUSION

Ameren Energy Communications Inc. commends the Commission for beginning its inquiry into broadband over power lines technology and looks forward to working with the Commission as it develops its regulations of this industry.

Respectfully submitted,

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