

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554**

In the Matter of)	
)	
Carrier Current Systems, including)	ET Docket No. 03-104
Broadband Over Power Line Systems)	
)	
Amendment of Part 15 Regarding)	ET Docket No. 04-37
New Requirements and Measurement)	
Guidelines for Access Broadband)	
Over Power Line Systems)	

REPLY OF CORTLAND E. RICHMOND, JR.
TO
COMMENTS OF PowerWAN, Inc.

These Reply Comments are filed in response to comments in the referenced NPRM by PowerWAN, Inc., hereafter referred to as "PowerWAN." The writer has been employed in the field of Radio Frequency Interference and Electromagnetic Compatibility in several technology areas since 1983, has held an Amateur Radio license over 40 years, and spent more than 21 years in the Army working with and on communications systems and electronic equipment.

PowerWAN writes,

As the electric power grid uses more sources of power generation and supply, including distributed generation, a communications channel along the power lines becomes an important part of safety and security. As better monitoring of the power grid becomes a reality, due to BPL, faster and better outage management control will become an important result. Restoration of power during a disaster scenario is the major necessity, and methods that lower the outage time are always necessary and welcome.

Reply:

PowerWAN and others have premised their deployments on compliance with Part 15. Under that Part they are not guaranteed the use of frequencies they intend to occupy. It is shortsighted to the point of irresponsibility to promote for safety or security a service not entitled to protection from interference, and one, moreover, which must itself cease operation should it cause harmful interference to radio reception. A subscriber believing PowerWAN's (and others') claims of utility might find itself lacking the very safety and security communications on which it had thought to rely, and with no recourse save the Courts. One might compare these offerings, and the hyperbole with which they are being sold, with renting cheap camping spaces (broadband access) in a County park (the radio spectrum). Traditionally, those who sell something they do not own have fared poorly before the Bench.

PowerWAN writes:

Amateur radio bands are notched in the PowerWAN system, so as to provide additional suppression in these areas. It should be noted that there are amateur radio operators who also have BPL systems in their homes and neighborhoods, and are satisfied that the systems do coexist without major difficulties. PowerWAN also has not seen the PowerWAN system to be susceptible to amateur transmitters operating in the same area. Other areas can be notched out of the PowerWAN frequencies of use, but this should be done at places in the spectrum where the frequencies and services are actually being used, and are not allocations for services left over from days past.

Reply:

Some evidence exists that notching is insufficient. Any generator of broadband spectrum is difficult to notch out sufficiently to the guarantee of freedom from harmful interference international conventions and Part 15 require. An impulsive source is inherently wideband, and PowerWAN's approach approaches that, further rendering notching less than effective. In addition, there are other licensed services occupying the spectrum between 2 and 80 MHz which PowerWAN neglects to say it is notching. They are at least as important as Amateur Radio. Where is PowerWAN's protection for them?

PowerWAN believes competing allocations are "left over from days past." Arguing against PowerWAN's assumption are the biannual World Radio Conferences which refine and confirm these allocations; they are not 'left over;'" they are up-to-date, and agreed upon by the participating Administrations . If PowerWAN is correct, the appropriate remedy is NOT to abuse Part 15's very liberal provisions, but to call a new Radio Conference to change the allocations. Until then, the United States, and the Commission, and PowerWAN too, are bound to treat allocations of the spectrum concerned as current -- and preemptive of BPL's* use of that spectrum.

(*NOTE: BPL, unlike any other Part 15 emitter, occupies large swathes of spectrum at once.)

PowerWAN writes:

PowerWAN also believes that spectrum pooling, similar to the concepts of what are being considered for 3G wireless communications, could be a candidate for BPL. There are several similarities between the technologies and services which make this idea worth considering.

Reply:

There is a very large difference between coordinating and pooling spectrum with only local reach, and spectrum which supports regional and global communications. PowerWAN has its blinders on. Even if PowerWAN were correct in this, because of the impact upon reception of distant transmitters, such pooling must be accomplished by Radio Conferences, not by squatting, "camel's nose in the door," upon licensed spectrum.

PowerWAN writes:

It should also be pointed out that the PowerWAN BPL system is designed to serve the last portions of a mile to a residence or business, and can support several types of backhaul facilities, such as fiber, broadband wireless, broadband satellite, cable, DSL, etc., and therefore, economically viable in many different environments and locations, including rural communities.

Reply:

The “last mile” is where many other technologies (named) exist and excel that do not generate harmful interference. Apparently PowerWAN proposes to serve these providers with a technology guaranteed to interfere. Not to put too fine a point upon it, this is a giant step backwards. And it is more likely that they would supplant BPL than the other way around.

PowerWAN writes:

A ubiquitous network as provided by BPL also becomes another communication infrastructure, which can be utilized during emergencies. It is also worth noting that the power infrastructure is likely better maintained than other communication service infrastructures, and due to its primary purpose of delivering power, is very robust.

Reply:

It is an emergency, an all too common one, when wires go down and power goes off. Is PowerWAN seriously saying its transmission means would be better maintained than an already infrastructure-deprived electrical network which does not even keep tree branches trimmed, and is vulnerable to drunk drivers? Does PowerWAN stand behind its statements here? Does it assume responsibility for the continuation of communications it proposes to provide? Does it have funds to do so? And is the Commission prepared, in order to maintain the promises of emergency communications being made, to regulate BPL Quality of Service? This writer believes the Commission, if it believed PowerWAN's promises, would have no choice but to mandate and measure QOS for BPL.

PowerWAN writes:

PowerWAN has found that power lines are very inefficient as antennas, and that they tend to act much like point source radiators. PowerWAN limits its frequency band to less than 50 Mhz.

Reply:

One might ask, “Compared to what?” Others, the ARRL, NTIA and Boeing, to name a few, have found that power lines are efficient enough antennas to pose a real threat of harmful interference, and complaints of harmful interference are even now being presented from BPL sites presently running. The NTIA study in particular should be sufficient to dispel the notion that power lines act like point source radiators.

PowerWAN represents that it limits its “frequency band” to less than 50 MHz. Even if so, what guarantees can it provide that no harmonics or mixing products will be generated on power lines already rife with induced RF from local broadcasting and others?

PowerWAN writes:

PowerWAN agrees with the equipment verification procedure for FCC part 15 compliance, and believes that the measurement methodologies proposed in the NPRM are adequate and meet the needs of the various parties. PowerWAN also agrees that the FCC proposal to exempt Access BPL systems from the existing conducted emission limits of Section 15.107(c) is prudent, while still protecting other users and services.

Reply:

Exempting Access BPL from conducted emission requirements may be justifiable on the Access segment. However, Access manufacturers and providers must remain responsible for conducted emissions induced or coupled to OTHER wiring. A conducted interference level determined to be harmful on its face in Part 15 is not less harmful because someone has managed to be officially ignored. If anything, occupants of premises to which service is delivered may be expected to be less competent than BPL manufacturers and providers to filter conducted emissions placed onto their wiring to lawful levels. Reports are that one BPL entity has even patented power-entry filtering, thus rendering the ability to comply with Part 15 subject to patent licensing and payment of fees. The writer notes in passing that patents have issued upon ignorance of prior art before; some BPL provider may yet patent the tin-foil beanie.

PowerWAN writes:

Adaptive interference mitigation techniques, such as frequency notching and shutdown of particular network elements, are feasible, and employed today in PowerWAN systems. These techniques should be used prudently, as the cost and complexity of the equipment will be affected as more requirements are specified. PowerWAN also believes that a particular specification as to frequencies of operation, and other specific control mechanisms, are not necessary. The modulation and interference mitigation techniques that make BPL feasible in the first place, are by nature, adaptable.

Reply:

Adaptive mitigation has so far been demonstrated insufficient, if a good try. It may yet become effective enough to provide some relief from harmful interference. It is in no way a guarantor of protection to reception of signals PowerWAN has not been made aware of. What PowerWAN calls “prudent,” spectrum users affected call mandatory; we would have PowerWAN and other BPL proponents protect signals based upon the Table of Allocations and FCC database, not the absence of official notice.

Contrary to PowerWAN's assertion, and thanks to various BPL trials, specific control mechanisms do indeed seem necessary.

PowerWAN writes:

BPL systems that are deployed today, or in the near future, without interference problems or complaints, should not be required to be replaced when new rules are introduced. This is due to the fact that BPL systems are deployed on a neighborhood-by-neighborhood basis, and can, and likely will, be upgraded as necessary, as communication throughput, capacity, and other service requirements change.

Reply:

One can well understand reluctance to replace a deployed and expensive plant. However, due to the impact of BPL upon long distance reception, and the unique characteristics of the spectrum involved, it would be short sighted not to require upgrading facilities in the field, presently few, to comply with such regulations as may be needed to allow use of the spectrum by licensed users and services. One example is Commission's approach to the phase-out of aircraft and commercial radios as narrower bandwidth channels were adopted.

PowerWAN writes:

As a particular local power provider's involvement will always be required in order to install BPL equipment, and the fact that BPL signals have been shown to be point source radiators with limited distance,² it is extremely likely that an interference problem would be easily localized to a particular vendor and power company. This makes the need for having a large, national database unnecessary. If there is an interference issue, the local power provider could be notified, similar to the way that this works today for power line interference issues. They would then verify and work with the vendor to correct the issue.

Reply:

PowerWAN could hardly have argued against its own case more eloquently than in this paragraph. Note the phrase, "*similar to the way that this works today for power line interference issues.*" These issues have proven to be of long standing, have evinced minimal utility cooperation, and have required repeated Commission intervention to bring to proper conclusions. If this is PowerWAN's idea of cooperation, we are all of us in for a hard time.

The database proposed is not to inform someone far away of the existence of an interfering technology at a distant location, but to inform anyone being interfered with whom to blame and where complaints should be directed. Given the proliferation of Part 15 devices and the many devices lacking compliance with Part 15, it is disingenuous to dismiss the need for one. Moreover, there may be an increase in due diligence from having BPL providers' and manufacturers' names published.

PowerWAN writes:

PowerWAN agrees with the FCC's proposed measurement guidelines and in-situ testing at three different sites each for both overhead and underground locations. Making measurements at power line height, however, brings up major safety issues, and would also be of great concern to the utility companies involved, especially at a 10 meter distance from the power line. PowerWAN believes that an alternative to power line height radiation measurements, especially at small distances from a POWER LINE, is required.

Reply:

Measuring antenna height above ground was identified as a problem by the NTIA. It can certainly be a safety issue. One should avoid bringing antennas and instruments into positions from which contact with energized supply wiring might result. Moreover, small untuned loops are notably insensitive. A need to elevate them to obtain accurate readings brings into question whether they are suitable for this task.

It is worthwhile also to ask if a quasi-peak measurement might be unsuitable for emissions such as PowerWAN's versus single-sideband victim receivers. The time constant of the quasi-peak detector (and algorithms to duplicate its readings) were derived from interference studies performed on AM broadcast signals, and while accurately portraying the extent to which interference is harmful to that modulation, have not been evaluated against others, in the Proceeding here, single-sideband and modern HF data transmissions. Moreover, the dynamic range for an accurate quasi-peak measurement requires a signal well above instrument and ambient noise. When combined with the rather low sensitivity of untuned loop antennas, an unsafe proximity to power lines might be needed. In this case, the Commission is well advised to reexamine whether the quasi-peak detector or loop antenna – possibly both – might be replaced for Access BPL measurements.

Conclusion:

The writer believes that, contrary to the insistence of proponents' attorneys and officers, wired BPL technologies now being deployed do not provide sufficient freedom from harmful interference for reception of radio signals to meet the intent of Part 15. A growing body of evidence and science exists to support this opinion. The writer therefore urges the Commission to refrain from granting its approval to widespread wired BPL rollout until these problems can be resolved.

Respectfully submitted,

17 June 2004

Cortland E. Richmond, Jr.