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CONSEIL CANADIEN DES TÉLÉCOMMUNICATIONS POUR LES SERVICES PUBLICS

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Response to Canada Gazette Notice, SMSE-004-13, June 29, 2013, Consultation on Proposed Revisions to the Canadian Table of Frequency Allocations.

Dear Sir,

The following are comments of the Utilities Telecom Council of Canada ("UTC Canada") in relation to the above-referenced Gazette Notice and Consultation Paper. These comments address the concerns of utilities in Canada regarding the proposed secondary amateur allocation in the 415 to 526.5 kHz range, specifically at 472-479 kHz. As explained more fully below, UTC Canada respectfully requests that Industry Canada not adopt the proposed allocation, due to potential interference to powerline carrier systems that operate in the 472-479 kHz band and that are used to protect the transmission grid from faults that can cause massive blackouts.

Background and Overview

UTC Canada is an industry association representing Canadian utilities and energy companies, as well as providers of telecommunications infrastructure or information technology services affiliated with these companies. UTC Canada was formed to deal with regulatory issues of common interest and to provide a forum for cooperation on technical and market issues facing its members. UTC Canada is affiliated with the Utilities Telecom Council, a Washington, D.C. based global trade association for electric, gas and water utility telecommunication providers. UTC Canada is pleased to file these comments on the above-referenced consultation, specifically on the one issue regarding the proposal to allocate the 472-479 kHz band on a secondary basis for amateur operations.

UTC Canada and its members are concerned that amateur operations in the band would cause harmful interference to powerline carrier (PLC) systems that operate in this band. Conversely, PLC systems could cause harmful interference to amateur operations in the band. Either scenario is unacceptable for utilities. Utilities could not afford to run the risk of receiving interference from amateur operations or causing interference to them.

Interference from amateur operations could either cause systems to trip when they shouldn't or prevent them from tripping when they should. Conversely, interference to amateur operations would require utilities to correct the interference or shut the PLC systems down altogether.

As noted above, PLC systems serve as the basis for teleprotection schemes that isolate faults on transmission systems and prevent them from cascading. These systems must remain highly reliable in order to ensure the safe, reliable and effective delivery of electricity to millions of customers. Moreover, there are no reasonable solutions for coexistence between PLC systems and amateur operations.

Accordingly, UTC Canada asks Industry Canada to consider the requirements of Canadian utilities which are using the 472-479 KHz band for their PLC systems and not to adopt the ITU secondary allocation for amateur service in this band.

Discussion

Utilities Rely on PLC Systems.

Utilities rely on PLC systems for teleprotection systems that isolate faults on transmission lines. For decades utilities have used PLC systems because they are reliable and cost effective. These systems provide an essential link to the devices that monitor and control the delivery of affordable electric services to the public at large. These mission-critical systems are designed to trip electric relays less than a second after a fault occurs on the electric grid in order to prevent cascading outages that could occur. Indeed, this cascading scenario is precisely what occurred on August 14, 2003, when a single fault due to vegetation contact with a high voltage transmission line could not be cleared, resulting in the largest power blackout in North American history that affected an area with a population of approximately 50 million people in Ohio, Michigan, Pennsylvania, New York, Vermont, Massachusetts, Connecticut, New Jersey, USA, and Ontario, Canada.

Utilities Operate PLC Systems at 472-479 kHz.

Some utilities in Canada have raised concerns about the impact of the proposed revision to the Canadian Table of Frequency Allocations on their PLC systems operating in the 472-479 kHz range, including on transmission lines that interconnect with the United States. PLC systems operate on 4 kHz wide channels, such that amateurs could interfere with PLC systems as low as 470 kHz and as high as 481 kHz. In addition, the ITU allocation would permit operations of 1 W EIRP or up to 5 W EIRP for certain countries. There are no limits on antenna size or design. Power limits without any limit on antenna size or design will not prevent interference problems with PLC systems.

As PLC Systems are Unlicensed, Amateur Operations Would be Primary

PLC systems operate on an unlicensed basis, and amateur operations in the band would be primary to such PLC unlicensed operations. Consequently, PLC systems would be required to correct harmful interference to amateur operations or shut down if necessary.

Conversely, PLC systems would be required to accept interference from amateur operations.

The Likelihood and Impact of Interference to and from PLC Systems is High.
Most utility PLC applications use two types of PLC schemes: ON/OFF and Frequency Shift Keying.

ON/OFF equipment is normally in the off state except for short (less than 1 second) encoded test bursts which occur automatically or manually between 1 and 3 times per day. These test bursts ensure that the communications path is valid, given that the system is normally in the off state. This is used to detect equipment failure only. When a power system disturbance occurs, a brief transmission is sent which prevents a utility transmission line's remote breaker from opening. This is called blocking. This transmission contains no encoding and is generally 10 watts. If this signal is interfered with, unfaulted lines will disconnect from the power system resulting in unnecessary outages. The receiving locations have a 4 millisecond window in which the decision to open a breaker is made or prevented.

Frequency Shift Keying (FSK) normally sends a 1-watt "status" or guard signal to a remote location. Upon detection of a power system fault, the guard signal is frequency shifted to a command to "trip". The trip signal is boosted to 10 watts for better signal to noise performance under presumed fault conditions. When the remote receiver detects this signal, the power line is disconnected from the power system. This disconnection takes place regardless of where or if there is an actual fault. Generally, it takes less than 32 milliseconds to start the process of opening a breaker. The process cannot be stopped once it is started. PLC receivers using FSK can be "captured" by an interfering signal, possibly created by an amateur operator. An external signal appearing on the correct frequency with enough signal strength to satisfy the receiver's security could be generated by amateur operators potentially located anywhere within several miles of the entire length of the PLC protected line.

Amateur operators would not detect PLC systems that use ON/OFF or FSK modulation schemes. Thus, they could not avoid causing interference to PLC systems by listening before transmitting. Moreover, given the low latency requirements of PLC systems, the threat of interference, even for a fraction of a second, could have significant consequences. Interference from amateur operations could be interpreted by the PLC system as a frequency block. This could cause instability on the transmission lines, which could lead to widespread outages.

There is a high likelihood of interference to PLC systems, particularly where amateur operations are in close proximity to PLC systems. Amateur operations are licensed such that they can operate at any place where there is an amateur allocation. If there was an amateur allocation at 472-479 kHz, amateurs could freely operate in close proximity to transmission lines without the utility knowing that they were there. Utilities would probably only become aware of these operations when it was too late, because they would experience unexplained outages or mis-operation of PLC systems.

Inteference to PLC systems has to the potential to cause widespread electrical outages. An unplanned, unexpected trip of a transmission line may result in instability at the connected substations, switching stations and/or generating stations. If the affected transmission line terminates at a generating station, instability can result in the generating station tripping off line and disconnecting from the power grid. If this occurs during conditions of high demand, the sudden loss of the generation asset can result in instability in the entire grid of which it is a part. If a heavily loaded transmission line trips during a period of high demand, its loss to the power grid can result in widespread or cascading outages.

<u>The Risk of Interference is Difficult to Mitigate.</u>
Aside from a power limit of 1 watt EIRP, there are no limits on antenna size or design that would otherwise limit the potential for interference from amateur operations. Power limits alone offer insufficient protection against interference to PLC systems. Also, utilities cannot easily modify PLC systems to avoid interference.

In this regard, retuning PLC systems is a complex, time consuming and expensive process. PLC frequency allocation is mapped (distributed) to avoid repeating usage of a frequency band for two consecutive transmission lines or lines on the same towers. A change to the frequency of just one transmission line using PLC would require the following actions:

1. Engineering study to determine available frequency bands and if additional lines will need frequency band changes because of the first change and evaluate whether existing equipment can be adjusted to the new frequency.
2. Perform cost analysis to determine if this change is more cost effective than the next budget-conscious alternative.
3. Procure new equipment if needed. Some PLC equipment has had historically long lead time times.
4. Allocate engineering resources to produce new settings and drawings for the new or existing equipment at all affected terminal.
5. Schedule an outage on the bulk electric system. This could take months to schedule based on approvals that we would have to obtain from regional transmission operators and coordination needed for the allocation of resources to perform the work.
6. Allocate field resources to complete the PLC frequency change, including removal or adjustments to existing functioning equipment, installing any new equipment, and commissioning the revised design.

Retuning in this case would also be made more complex by the fact that some of the transmission lines with PLC systems operating in the 472-479 kHz band are interconnects with the United States. Retuning those lines would require international coordination with the United States.

Finally, utilities cannot easily replace PLC systems with alternative technologies, because they do not provide the same performance capabilities and/or these technologies are not as cost effective as PLC systems, particularly in rural areas.

There is No Compelling Need to Adopt a Secondary Amateur Allocation in the 472-479 kHz Band.

By comparison, there is no compelling need to adopt a secondary amateur allocation at 472-479 kHz band. Amateur use of the band could be conducted under experimental licenses, which would provide protection for PLC systems and greater control over amateur operations as amateur operations would not be primary to PLC and their location and operational specifications would need to be approved and publicly disclosed by Industry Canada. While amateurs may prefer to have a secondary allocation at 472-479 kHz and not have to file an experimental application, they are not precluded from using this band if they don't have a secondary allocation at 472-479 kHz.

The ITU Did Not Account for Use of the Band for PLC When It Allocated the 472-479 kHz Band for Amateur Use on a Secondary Basis.

While it is clear that ITU did consider other licensed operations in the band, such as radiolocation systems, there is no mention of PLC systems or provision for protecting them from amateur operations. One explanation for this could be that other countries may not use the 472-479 kHz band for powerline carrier systems to protect bulk transmission systems. For example, in Europe only the 3-95 kHz band is used for PLC by energy providers; the frequencies above 95 kHz are used for consumer applications and even those consumer PLC allocations only extend to 148.5 kHz.

Conclusion

UTC Canada believes that the public interest in reliable electricity transmission outweighs the interest in amateur use of the 472-479 KHz band for experimental purposes. Moreover, less risky alternatives for amateur use exist, such as allowing amateurs to apply for experimental licenses to operate in the band.

In the United States, the Federal Communications Commission (FCC) rejected an amateur allocation at 135.7-137.8 kHz due to the potential for harmful interference to PLC systems. Specifically, it found that "a new amateur allocation in the LF range of the radio spectrum is not justified when balanced against the greater public interest of an interference-free power grid."[1] Further it found that "the opportunity to experiment with LF operations provided to amateur radio operators under our Part 15 rules and though our experimental licensing process, while less attractive to amateur operators than their own proposal, provides the appropriate means for such use in light of the compelling uses in the band."[2]

While amateurs argued that the FCC should disregard unlicensed operations, the FCC replied that although unlicensed PLC operations have no protection status, "they provide a vital service."[3] Further, it found there was significant potential for interference between

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[1] Amendment of Parts 2 and 97 of the Commission's Rules to Create a Low Frequency Allocation for the amateur Radio Service," Report and Order, ET Docket No. 02-98, 18 FCC Rcd. 10258 at ¶16 (2003).

[2] *Id*.

[3] *Id*. at ¶17.

PLC and amateur operations, adding that "[w]e will not jeopardize the reliability of electrical service to the public."[4] It explained that "utility companies have raised a valid concern that an allocation for the amateur service could result in the need for PLCs to modify or cease their operations to avoid causing interference to amateurs." It also recognized that "utility companies have come to rely on PLC systems for monitoring and control of the power grid, and that the alternatives suggested by [amateurs] may not be as effective and would be costly." Thus, it was "persuaded that the costs of replacing PLC systems would be significant and would be disruptive to the public, and is not justified merely to open this band to amateur use on a secondary basis."[5] The FCC affirmed its reasoning on reconsideration.[6]

For similar reasons - the high likelihood of interference between PLC systems and amateur operations if a secondary allocation is adopted at 472-479 kHz, the significant potential impact of such interference on the reliability of electricity supply and the lack of reasonable means to mitigate the risk of interference - UTC Canada asks Industry Canada not to adopt a secondary allocation for amateur services at 472-479 kHz.

UTC Canada thanks Industry Canada for the opportunity to comment on its proposed revisions to the Table of Frequency Allocations.

Yours sincerely,

Alourdes Sully
Chairman of the Board
Utilities Telecom Council of Canada

September 27, 2013

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[4] *Id*. at ¶18.

[5] *Id*.at ¶19.

[6] Amendment of Parts 2 and 97 of the Commission's Rules to Create Low Frequency Allocation for the Amateur Radio Service, *Memorandum Opinion and Order*, ET Docket No. 02-98, 19 FCC Rcd. 6536 (2004).