

File: 3300-BPL

2005-11-28

Dr. Robert McCaughern
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Subject: **Radio Advisory Board of Canada Response to
Canada Gazette Notice SMSE-005-05 dated 2005-07-30
Consultation Paper of Broadband over Power Line (BPL)
Communication Systems**

Dear Dr. McCaughern;

Attached is the Radio Advisory Board of Canada's response to Canada Gazette notice SMSE-005-05 dealing with Broadband over Power Lines (BPL).

The Radio Advisory Board of Canada commends the Department for the timely release of this consultation paper.

This response was prepared by a broadly representative group with participants from Canada, the USA and Europe.

This response was balloted to Board members. Fifteen of 22 members voted:

- Five Approved;
- Seven Approved with comment;
- Two Abstained; and
- One Disapproved, with comment.

Members' comments, which form an integral part of the Board's response, are:

- APCO Canada

Particular care must be taken to ensure that there is no increased threat to public safety communications. This especially includes amateur radio as a critical link in public safety communications. Particular care must also be shown in considering the potential for interference with medical equipment, both in hospitals and even more critically – equipment used by emergency medical first responders in the field.

While proponents of BPL represent the odds of interference as being minimal or virtually nil, it must be realized that the systems that are threatened by such interference are critically important, especially in time of disaster.

- CBC – *Disapproved, with comment*

The CBC does not agree with the statement that "RABC accepts the definition of BPL systems as unintentional radiators", which is the base argument of the response. The CBC believes that due to the inherent physical nature of power cable system, radiation in protected bands is inevitable. BPL usage should be coordinated with all allocated users of the spectrum between 1.7 MHz and 80 MHz. For more information, please refer to the CBC submission.

- CCTA

The comments made by CCTA were mistakenly overlooked and do not appear in the final version of RABC's submission. CCTA raised many important issues relating to Broadband over Power Line (BPL) services having the potential to interfere with wireline networks, such as those operated by cable and telephone companies. CCTA even brought this issue to the attention of the telephone companies during RABC conference calls. Telephone networks and VDSL services were listed as non-radio services potentially affected by BPL but cable was omitted. In addition, Cable believes that telecommunications services, non-radio-based should also be granted some protection. Cable further suggests that BPL service providers should be required to conduct regular and on-going monitoring and reporting, similar to cable companies, to ensure that emissions are kept within reasonable limits.

CCTA's specific comments which should have been incorporated into the text are the following:

In Section 4.2, first bullet - Cable television and telecommunications networks should clearly be added to this section. Cable's high-speed service, particularly the return band, are susceptible to the potential harmful interference caused by BPL systems.

In Section 6.1 the following should replace the existing text.

The RABC considers that, due to the potential of BPL systems to interfere with many existing HF/VHF spectrum users, the Department has an extraordinarily high "duty-of-care" with respect to guarding against harmful interference produced by any Access BPL operations it may authorize. The RABC supports the Department in proposing a certification process that requires measurement test reports for BPL equipment, demonstrating compliance with established performance standards.

The RABC therefore recommends that the Department develop a new ICES to deal with BPL systems. This ICES, and related radio standards, should aim to protect licensed radiocommunication and telecommunications services from interference generated by BPL systems. It should be consistent with similar Canadian standards and procedures, e.g. BPR-8, RSS-210.

Moreover, the Board also believes that it is important that each Access BPL operator be required to ensure that its overall system will comply, in all places and at all times, with established unwanted radiation limits through a continuous periodic monitoring and reporting programme which provides measurement results and descriptions of any corrective action taken throughout the period.

- DND

The RABC response states in para 6.2 that "the Board is divided on harmonizing emissions limits with those of the FCC". DND is one of the RABC members that makes extensive use of the fixed and mobile (including naval and aeronautical) HF bands and favours lower emission limits for BPL equipment. The proposed RABC mitigations techniques are necessary and important ways for BPL unintentional radiators to "share" the radio spectrum with present and future radio licensed users.

- MAAC

Request interference issue tests for our 72 MHz band for Radio controlled

- NAV CANADA

Re. RABC Response 6.3 (a) Prohibited Frequency Bands:

NAV CANADA supports Industry Canada in the exclusion of ALL aeronautical frequency bands from BPL (access and in-premise).

Rationale:

In the 1.7-80 MHz band, aeronautical systems use narrow-band amplitude modulation techniques which tends to make these systems vulnerable to noise. Many frequencies in the 1.7 MHz - 80 MHz band are allocated for AERONAUTICAL RADIONAVIGATION, AM(R)S and/or AM(OR)S.

NAV CANADA operates very sensitive Upper Side Band HF receiver equipment used to communicate with aircraft in Oceanic airspace and Domestic and Northern areas of Canada. All HF AM(R)S designated spectrum in Canada as found in ITU Radio Regulation Appendix 27, all HF AM(OR)S designated spectrum in Canada as found in ITU Radio Regulation Appendix 26 including the Emergency designated channel 5680 MHz must be protected from both Access BPL and In-premise BPL. To protect flight safety, BPL technology must never use AM(R)S or AM(OR)S spectrum.

The 74.8-75.2 MHz marker beacon band is part of the Instrument Landing System and must be protected and only used for Aeronautical purposes as allocated by the ITU. To protect flight safety, no BPL transmissions should be allowed in this band

Because of noise from BPL transmitters, a guard band for each aeronautical channel or band excluded from BPL will be required.

Re. RABC Response para. 6.3 (b) Geographic restriction

Physical separation protection criteria between power lines carrying BPL service and aeronautical ground receivers will need to be applied. NTIA and ITU studies for HF and VHF aeronautical receiver protection should be considered. NAV CANADA can provide the particulars of sites that require protection upon request.

- Radio Amateurs

Radio Amateurs of Canada (RAC) was an active participant in the preparation of this response and generally concurs with the content. However, RAC offers the following additional comments, based in part on new information that has come to the attention of RAC.

The Annexes to the letter outline the frequency band exclusions and exemptions requested by some participants. They are extensive, and if implemented in their entirety, would really leave little room for BPL in the spectrum below 30 MHz. Clearly this would create problems in the development of standards for BPL equipment and systems and in the management of BPL operations.

Since the RABC response was drafted, RAC has learned that advances in BPL Access technology over Low Voltage (LV) power lines have shown that it is possible to reduce interference to radio services below 30 MHz to acceptable levels. In addition, RAC has also learned that some BPL Access systems over Medium Voltage (MV) lines use the frequency band 30 to 50 MHz to minimize interference to radio services in the more heavily used spectrum below 30 MHz. However, significant problems remain with the mitigation of interference from BPL Access distributed over Medium Voltage (MV) power lines. RAC recommends that in formulating the standards for BPL systems, Industry Canada examine and encourage the use of BPL Access over LV lines instead of over MV lines, and in the 30 to 50 MHz frequency band.

The demarcation between telecommunication and radiocommunication systems is becoming blurred as technological advances increasingly enable their merger. RAC sees BPL Access as a data and telecommunications technology whose distribution over power lines, while potentially beneficial to some Canadians, has demonstrated severe and continuous interference to radio services, especially the amateur service, in the spectrum 2 to 80 MHz. Although the Department is approaching its development of interference-reducing measures and equipment/system certification standards from the perspective of the Radiocommunication Act, RAC is unclear on the exact Canadian regulatory framework governing BPL deployment and operations and the impact that this framework should have for both Canadian radio spectrum users and BPL Access service providers.

BPL Access is competing with other Internet Access service providers. These other providers must provide, at their own cost, the infrastructure for Internet Access by means such as wireless, cable or satellite. These services are non-interfering; that is, they can co-exist with other radio services without any

interference. BPL unfortunately is invasive, and capable of disrupting other radio services. Further, the electrical power distribution is part of a public utility, and in some provinces is subsidized by the public. If the maintenance of BPL Access equipment is supported by hydro rate payers, RAC considers that BPL access providers would have an unfair advantage in providing a service in a competitive environment and which may interfere with and disrupt radiocommunications in a widely-used and highly-important part of the radio spectrum for international and domestic communications. In addition, some electric utilities may wish to use BPL for telemetry and load control purpose to their customers, and thus might piggy-back on it to offer Internet Access at a rate lower than could be offered by Cable or other providers.

RAC recommends that while preparing the standards for BPL equipment and systems, the Department also clarify the regulatory framework governing BPL deployment and operations.

With respect to standards, RAC recommends that the emission level for BPL systems be 1 uv/m at 30 m. However, many technically competent amateur radio operators recommend that the limit be reduced to 0.3 uv/m, which will permit communication at weak signal levels.

- Rogers

Rogers urges Industry Canada to take a very cautious approach to BPL and to address the interference concerns that have been raised by the RABC and the CCTA so that incumbent systems are not adversely affected by BPL.

The response which follows is numbered according to the Consultation paper.

Yours truly

Original signed by

Paul Frew
President

Response

General

The RABC appreciates that BPL is a developing data transmission and telecommunications technology that may benefit both the Canadian public and Canadian power utilities. At the same time, BPL developments and trials over the past five years have shown that BPL has marked potential to interfere with radiocommunication services in the LF, MF and HF bands as high as 80 MHz. Interference from BPL systems has been examined in equipment and system trials over the past five years, and remains a controversial subject even though there have been advances in BPL technology and interference mitigation techniques. The electrical power grid provides an existing, but not a purpose-designed, infrastructure for the transmission of data by BPL, and as such can act as an antenna system for BPL radiation.

The RABC accepts the definition of BPL systems as unintentional radiators as currently defined in Canadian standards. The RABC notes that they are different in kind from conventional electrical and electronic devices especially in that the radiation is continuous. The RABC trusts that Industry Canada will take appropriately stringent measures to protect radiocommunication services from harmful interference. Given the nature of radio propagation, particularly at HF frequencies, BPL has the potential to interfere with radiocommunication services in both Canada and other countries. The consideration of standards for BPL systems and interference mitigation techniques must, therefore, take into account both domestic and international radio regulatory requirements.

Currently, the ITU-R is studying the potential effects of BPL on radiocommunication services below 80 MHz and is examining the need for new regulations to protect them. Article S 15.12 of the Radio Regulations states that: administrations shall take all practicable and necessary steps to ensure that the operation of electrical apparatus or installations of any kind, including power and telecommunication distribution networks, but excluding equipment used for industrial, scientific and medical applications, does not cause harmful interference to a radiocommunication service and, in particular, to a radionavigation or any other safety service operating in accordance with the provisions of these Regulations (in this matter, administrations should be guided by the latest relevant ITU-R Recommendations).

In Section 2 of its document, the Department provides a number of reasons why it should authorize BPL systems in Canada. For example, at page 2 it says, "*Considering the similarities between the U.S. and Canadian power distribution grids BPL manufacturers will view Canada and the U.S. as a common marketplace.*"

The RABC appreciates that equipment manufacturers, especially foreign ones, may view Canada as an extension of the US market. Clearly, a substantial degree of harmonization of technical standards and procedures with the US would be preferred, if Canadian users are to obtain foreign-made equipment at reasonable prices, or if there is any chance that a Canadian supplier might wish to serve the entire North American market. Nevertheless, there may be valid reasons in a variety of areas for Canada to take a somewhat different approach in its implementation of BPL from that of the US. Flexibility to do so should not be compromised by a quick, across-the-board adoption of US operational and equipment standards.

The RABC suggests that the Department needs to be as stringent in providing standards and procedures for BPL as it does in all other areas of spectrum management. BPL cannot be treated any differently than, for example cable television, where leakage of RF noise can be harmful to authorized users operations. Authorized users include those citizens listening to international HF Broadcast and Amateur Radio Operators who, in the most part, live in urban areas and will be most affected by unintentional BPL emissions.

3. General Description of BPL Systems

At this time, the Department is proposing to adopt the following definition for Access BPL systems:

Access Broadband over Power Line (Access BPL): A carrier current system installed and operated on an electric utility service as an unintentional radiator that sends radio frequency energy on frequencies between 1.705 MHz and 80 MHz over medium-voltage lines or over low-voltage lines to provide broadband communications and is located on the supply side of the utility service's points of interconnection with customer premises.

The Department seeks comment on the above definition and its suitability for describing Access BPL.

The Board concurs with this definition. However, similar to the FCC's clarification in its definition for Access BPL that it does not include power line carrier systems or In-premise BPL, the Board recommends the inclusion of a similar statement clarifying that the Access BPL does not include power line carrier systems as currently defined in RSS-Gen (Section 8), and In-premise BPL which is to be defined in ICES-006. This clarification could be provided in the scope of the proposed Interference Causing Equipment Standard (ICES) for Access BPL equipment.

Further, the Board recommends that the definition of power line carrier system in RSS-Gen would need to be updated to include that it is an unintentional radiator and operated within the band 9-490 kHz. In addition, the provision of new rules for the operation of power line carrier systems would need to be investigated.

3.3 In-house BPL

At this time, the Department is proposing to adopt the following definition for In-house BPL systems:

In-house broadband over power line (In-house BPL): A carrier current system, operating as an unintentional radiator, which sends radio frequency energy by conduction over electric power lines that are not owned, operated or controlled by an electric service provider. The electric power lines may be aerial (overhead), underground, or inside the walls, floors or ceilings of user premises. In-house BPL devices may establish closed networks within a user's premises or provide connections to Access BPL networks, or both.

The Department seeks comment on the above definition and its suitability for describing In-house BPL.

The Board considers that the phrase “in-premise” should be used rather than “in-house” to ensure clarity – premise makes it clear that several different types of buildings may be considered. The Board observes that definitions are still evolving, but the Board remains committed to “in-premise” for clarity.

4.2 Deployment Issues

Besides the potential interference to authorized radio services in the 2-80 MHz frequency range as noted, the deployment of BPL systems could also cause harmful interference to non-radio services and devices, such as, the following:

- Telephone network including DSL and Very High Bit Rate Digital Subscriber Line services (VDSL);
- Life-supporting medical equipment in hospitals; and
- AC Wire Carrier Current Devices installed in premises under ICES-006 could be subject to conducted interference since they could share the same low voltage wires as the Access BPL systems.

In addition there is a potential for BPL harmonic and inter-modulation interference to bands below 2 MHz and above 80 MHz – see Annex D.

6.0 Discussion and Proposals

The following sections invite comment on specific standards and requirements for Access BPL systems. The Department also seeks comment on any other specific issue or concern relating to the Department’s role in the deployment and regulation of BPL systems in general.

The RABC’s detailed comments follow.

6.1 Equipment Standard and Approval Process

The Department is considering the development of a new Interference Causing Equipment Standard (ICES) for Access BPL equipment. With regard to demonstrating compliance with the technical standards, the Department has a number of options ranging from Declaration of Compliance to Certification.

Industry Canada believes that the potential for interference to existing radiocommunication services warrants an approach that will ensure equipment compliance with the technical standard. Therefore, the Department is proposing that the certification process be used for Access BPL equipment. The certification process will include the submission of a test report that will demonstrate compliance with the standards in the appropriate ICES.

The Department seeks comment on the proposed certification process and what, if any, alternative approaches could be used to authorize BPL equipment and systems.

Please provide rationale.

The RABC considers that, due to the potential of BPL systems to interfere with many existing HF/VHF spectrum users, the Department has an extraordinarily high “duty-of-care” with respect to guarding against harmful interference produced by any Access BPL operations it may authorize. The RABC supports the Department in proposing a certification process that requires measurement test reports for BPL equipment, demonstrating compliance with established performance standards.

The RABC therefore recommends that the Department develop a new ICES to deal with BPL systems. This ICES, and any related radio regulations, should aim to protect radiocommunication services from interference generated by BPL systems; it should be consistent with similar standards and procedures, e.g. BPR-8 or RSS-210.

Moreover, the Board also believes that it is important that each Access BPL operator be required to ensure that its overall system will comply, in all places and at all times, with established unwanted radiation limits through, for example, a continuous monitoring programme.

As always, the Board stands ready to assist the Department in establishing the standards.

6.2 Prospective Technical Requirements

(a) Emission Limits

Access BPL systems operating below 30 MHz will be subject to following limits:

| Frequency (MHz) | Field strength (microvolts/metre) | Measurement Distance (metres) |
|-----------------|-----------------------------------|-------------------------------|
| 1.705-30.0 | 30 | 30 |

Access BPL systems operating above 30 MHz will be subject to the following limits:

| Frequency (MHz) | Field strength (microvolts/metre) | Measurement Distance (metres) |
|-----------------|-----------------------------------|-------------------------------|
| 30-80 | 90 | 10 |

The Department seeks comment on the above limits and their suitability for Access BPL systems in Canada.

Please provide technical rationale.

The Board notes that the above emission limits are as revised by the Department per their note on *Strategis* dated 7 October 2005.

The Board is divided on harmonizing emissions limits with those of the FCC.

The Board notes that the FCC has stated separate emission limits for Access BPL systems operating over medium voltage lines and for Access BPL systems operating over low voltage power lines. It is not clear from the Department’s proposal whether the emission limits stated above are applicable for operation over medium or low voltage power lines, or both.

Consequently, those Members of the Board favouring harmonization recommend that the proposed emission limits should be harmonized with the FCC's current and likely future/amended emission limits and restated as follows:

(i) Access BPL systems operating over Medium Voltage Power Lines

Emission limits as stated above, and in the consultation paper.

(ii) Access BPL systems operating over Low Voltage Power Lines

(a) Access BPL systems operating below 30 MHz will be subject to the following limits:

| Frequency (MHz) | Field strength (microvolts/metre) | Measurement Distance (metres) |
|-----------------|--------------------------------------|----------------------------------|
| 1.705-30.0 | 30 | 30 |

(b) Access BPL systems above 30 MHz will be subject to the following limits:

| Frequency (MHz) | Field strength (microvolts/metre) | Measurement Distance (metres) |
|-----------------|--------------------------------------|----------------------------------|
| 30-80 | 100 | 3 |

The Board suggests that for (ii) (b) above 3 metres may be an impractical measurement distance because of the frequently wide spacing of the power conductors. The RABC suggests that a more practical distance would be 10 metres which would result in a specification of 30 $\mu\text{V}/\text{m}$ at 10 m.

Some RABC Members do not agree with the emission limits as proposed. For many users, HF is used for weak-signal communications systems in which signals frequently vary from "strong" to barely above "atmospheric/galactic noise" or receiver noise. These users consider that an emission limit of 1 $\mu\text{V}/\text{m}$ at 30m¹ would result in an acceptable level² of interference which would allow practical use of the HF band for the intended communications.

The Board also considers that until more is known about the effect of BPL signal on life-supporting medical equipment, a conservative approach would require that any BPL signals, whether access BPL or in-premise BPL, should not result in electric field levels that exceed electromagnetic environmental levels typically encountered within hospitals (e.g., 0.1 V/m). Seeing that interference malfunction mechanisms are often uncertain and unexpected, the above electric field limitation should apply over the full anticipated BPL frequency range (e.g., 1.705 MHz to 80 MHz, and perhaps higher if harmonics are present). Compliance might be established by an appropriate site survey within any hospital areas where life-supporting medical devices may operate.

It should be noted that the Department considers 50 $\mu\text{V}/\text{m}$ at 3 metres acceptable for leakage from Cable systems (IC BPR Part 8 issue 1 June 2005, Part 4.3). At 30 metres, this level is equivalent to 5 $\mu\text{V}/\text{m}$. (This is also equivalent to 16.7 $\mu\text{V}/\text{m}$ at 10 metres.)

¹ See Annex E for the technical rationale for this limit.

² See RABC response to SMSE-002-05 (UWB), page 2 for a discussion of acceptable vs. harmful interference

(b) Interference Mitigation Requirements for Access BPL Systems

In addition to establishing appropriate emission limits, the Department is proposing that Access BPL equipment/systems incorporate adaptive interference mitigation techniques to minimize the potential for interference to radiocommunication users. These include:

- *remote controllable shut-down features;*
- *remote power reduction; and,*
- *notch filtering and/or frequency avoidance.*

The Department seeks comment on whether:

- (1) Access BPL equipment should incorporate adaptive interference mitigation techniques as described above; and,***
(2) additional or alternative interference mitigation techniques, if any, should be used to minimize the potential for interference to authorized services.

Please provide rationale.

The RABC proposes the following interference mitigation techniques:

- a) minimum necessary output power should be used by each BPL system components at all times;
- b) BPL systems shall be able to remotely notch out, filter, or avoid any frequency or block of frequencies. The service provider shall be able to mitigate impact to local licensed or authorized users, as well as responding to local requests by authorized users;
- c) During the initial installation, a utility/provider might notice that their system radiates less in certain parts of the RF band depending on the physical and electrical characteristics of the power line segment on which the equipment has been installed. The Board believes that the utility/provider should make good use of these low radiating portions of the RF band. Furthermore, the Board suggests that Industry Canada instructs the utility/providers to investigate this option during initial installation; and
- d) The board recommends that notching or frequency avoidance be applied to those HF and low VHF frequencies used by those users as Radio Amateurs, and HF broadcasting listeners. These users contend that the typical signals being received are very low in level, and therefore the BPL unintentional radiation limit should be no more than 1 $\mu\text{V}/\text{m}$ measured at 30 metres on those notched or avoided frequencies. Annex E contains a list of Amateur service authorized frequencies.

In addition to the mitigation techniques mentioned above, the RABC considers that BPL providers should extinguish BPL signals on all power lines where these signals do not serve customers or provide internal communications.

The Department has proposed a number of technical requirements to address the use of Access BPL equipment and to minimize the potential for interference to authorized services from deployed Access BPL systems.

The Department seeks comment on any additional

Please provide supporting technical rationale.

6.3 Operational Requirements

(a) Prohibited Frequency Bands

The Department is proposing to prohibit Access BPL systems from operating in specific frequency bands including bands used for aeronautical services, public safety and national defence. The Department believes that this approach is necessary to ensure the protection of safety-related services.

The Department seeks comment on:

- (1) the suitability of the above approach to protect safety-related services;***
- (2) what other approaches, if any, should be taken to protect safety-related radiocommunications; and***
- (3) what bands, if any, should be excluded from use by Access BPL systems.***

Please provide rationale.

The Radio Advisory Board of Canada approves this approach and offers the following specific comments.

See Annexes A through D for specific exclusions (by frequency and/or location) needed by various agencies for safety of life, national security and broadcasting. These annexes are listed in the order presented by RABC members and do not reflect any order of priority from the RABC.

Because of the large coverage achieved as compared to high-band VHF and UHF-TV channels, low-band TV channels 2-5 (54-82 MHz) are used extensively throughout Canada, especially by the main national networks. These channels provide much of the analog television service that is now available in rural Canada, which evidently is also one of the primary target markets for Access BPL. Often these low-band TV signals are relatively weak in the rural areas and therefore quite susceptible to noise-like interference. While Channels 2-5 will not figure prominently in the post-analog TV allotment plan for Canada, they will be used for digital TV services during the transition period. Digital TV services using the ATSC transmission standard are particularly prone to complete service outage due to high levels of in-band noise, such as that radiated unintentionally by Access BPL systems.

For these reasons, the Board believes that the Department should protect low-band VHF channels against Access BPL interference, at least until the DTV transition is complete and most of these channels are no longer required for TV. The simplest means of doing this would be to cap the upper frequency limit for Access BPL at 54 MHz. If desired, a footnote could be added, indicating that this limit will be reviewed as more evidence concerning unwanted BPL radiation above 30 MHz becomes available and/or when TV services no longer utilize this spectrum.

(b) Geographical Frequency Restrictions and Coordination Requirements

The Department believes that there could be specific geographic areas where Access BPL systems should not be deployed and that coordination with specific authorized users may be necessary.

The Department seeks comment on:

- (1) What specific geographic locations, if any, should Access BPL systems be prohibited from operating?***
- (2) As opposed to total ban, should Access BPL systems be able to operate in these locations if specific frequencies were avoided?***
- (3) What procedure, if any, should be used to facilitate coordination between BPL operators and specific authorized users?***

Please provide rationale.

Please refer to the previous comment regarding the undesirability of BPL emissions in the VHF television bands 54-72 MHz and 76-80 MHz. Should the Department conclude that it will allow Access BPL to operate in these bands licensed on Channels 2-5, transmissions should be permitted only in areas located outside the service contours of any regular television stations, low-power stations or allotments utilizing these channels.

Deployment of BPL adjacent to, or within, healthcare facilities should be restricted until further information is available. Also, with the current trend to provide treatment of selected patients in their homes, medical devices destined for homecare environments should be designed to comply with IEC immunity standards.

(c) Interference Resolution

The Department is considering requirements for BPL operators to address potential interference complaints. In particular, individuals and organizations with complaints would be asked to directly contact Access BPL operators to investigate and resolve problems. If a problem could not be resolved satisfactorily or in a timely manner, the Department would address the problem as an interference complaint under the Radiocommunication Act.

The Department seeks comments on:

- (1) its proposal that individuals and organizations refer problems to BPL operators to investigate and resolve matters on a timely basis; and***
- (2) what other approaches could be taken to ensure the resolution of interference complaints?***

Please provide rationale.

The Board believes that Industry Canada should be the first contact when interference occurs to services that were previously received without difficulty. If BPL is authorized, it will be necessary for the Department's District Offices to be prepared to handle such complaints, act as a

source of information and direct complainants to the appropriate BPL system operator for resolution.

Rationale: The difficulty for users is always to identify the mechanism that is causing signal impairment. BPL digital signals will produce non-coherent, noise-like interference in receivers. Users will simply not know the source of this noise because they will not be able to decode the message content. It is therefore impractical to think that people experiencing interference could refer to a central source of information on BPL (e.g. a publicly-available database), determine the identity of the specific offending service and then deal directly with that operator. In practice, the public usually complains to the licensee of the service they are trying unsuccessfully to receive. These operators should not have to incur the expense of being the "front-line" contact for handling BPL complaints. If the Department intends to permit the use of new services that have a potential to cause interference others then it must be prepared to act as the first contact for any resulting service complaints.

Industry Canada believes that establishing a publicly accessible database would assist in the timely resolution of interference complaints. Therefore, the Department is of the opinion that a database of BPL installations should be developed and maintained.

The Department seeks comment on the establishment of a publicly accessible database and its potential to ensure the timely resolution of interference complaints. In particular:

- (1) What specific information should be included in the database?***
- (2) How could the information be accessed and who should have access to the database?***
- (3) Who should develop, maintain and manage the database?***

Please provide rationale.

The RABC also believes that there should be a central internet Web site where the following information would be made available to the public no later than 30 days prior to the initiation of service:

- a. Regional/local point of contacts who would be capable of initiating actions within 24 hours aimed at addressing cases of suspected interference and resolving safety-of-life interference issues within 24 hours; and
- b. Registration of current and planned BPL deployment details in a user-friendly database for all BPL systems operating in Canada. Data at a minimum, for each system should include the name of the system operator, contact information, a list of the frequencies being used, and GIS data for the geographical area(s) covered by the system.

Rationale: Please see our previous comment regarding the need for the Department to operate as the "front-line" contact regarding BPL interference complaints. Having a database that can be accessed by knowledgeable affected parties, such as broadcasters, commercial radio licensees and radio amateurs, may reduce some of the Department's workload in this regard.

Conclusion

Subject to the foregoing comments, the Board generally, but not unanimously, supports the Department's proposal which is understood to be influenced by the FCC rules in their Report and Order for Access BPL. The Board would urge the Department when developing standards and regulations to take into consideration all RABC Members' concerns as well as Canadian and international activities and regulations including e.g. those of CRC, the ITU-R, the IEEE, and the NTIA's Phase 2 study on "Evaluating the effectiveness of newly adopted rules in reducing the risk of BPL interference" which is nearing completion, and the FCC's review of their several petitions for reconsiderations of their R&O.

Further studies are required on a variety of technical issues including the impact of BPL on healthcare services and systems.

The Radio Advisory Board of Canada is pleased to provide the comments above which aim to prevent potential harmful interference to radiocommunication services from BPL systems which might be deployed to meet the needs of Canadians.

Ω

Annex A

Canadian Coast Guard

Marine Communications & Traffic Services

All the frequencies listed here below are used by the Marine Communications and Traffic Services of the Canadian Coast Guard for the purpose of maritime distress, urgency and safety radio communications.

Therefore, Broadcast over Power Lines technology to be potentially deployed around or close to the following Canadian Coast Guard reception sites SHALL not cause any kind of interference in either reception or transmission on the frequencies listed here below.

| Reception site | Geographical Coordinates | Receiving frequencies |
|-----------------------------|---------------------------------|--|
| Cartwright (Labrador) | 53 43 38 North 56 58 09 West | 2182 kHz (Radiotelephony) 2118 kHz (Radiotelephony) 2142 kHz (Radiotelephony) 2206 kHz (Radiotelephony) 4083 kHz (Radiotelephony) |
| Hopedale (Labrador) | 55 27 25 North 60 12 43 West | 2182 kHz (Radiotelephony) 2118 kHz (Radiotelephony) 2142 kHz (Radiotelephony) 2206 kHz (Radiotelephony) 4083 kHz (Radiotelephony) 6212 kHz (Radiotelephony) |
| St. Lawrence (Newfoundland) | 46 55 06 North 55 22 51 West | 2182 kHz (Radiotelephony) 2118 kHz (Radiotelephony) 2206 kHz (Radiotelephony) |

| | | |
|-----------------------------|---------------------------------|---|
| Stephenville (Newfoundland) | 48 33 17 North 58 45 44 West | 2182 kHz (Radiotelephony) 2118 kHz (Radiotelephony) 2206 kHz (Radiotelephony) |
| St. Anthony (Newfoundland) | 51 29 56 North 55 49 30 West | 2182 kHz (Radiotelephony) 2118 kHz (Radiotelephony) 2206 kHz (Radiotelephony) |
| St. John's (Newfoundland) | 47 36 42 North 52 40 17 West | 2182 kHz (Radiotelephony) 2118 kHz (Radiotelephony) 2206 kHz (Radiotelephony) |
| Kingsburg (Nova Scotia) | 44 16 32 North 64 17 15 West | 2182 kHz (Radiotelephony) 2118 kHz (Radiotelephony) 2206 kHz (Radiotelephony) |
| Fox Island (Nova Scotia) | 45 19 47 North 61 04 46 West | 2182 kHz (Radiotelephony) 2118 kHz (Radiotelephony) 2206 kHz (Radiotelephony) |
| Kilkenny Lake (Nova Scotia) | 46 13 29 North 60 10 06 West | 2182 kHz (Radiotelephony) 2815 kHz (Radiotelephony) 2206 kHz (Radiotelephony) |
| Lockeport (New Brunswick) | 43 39 49 North 65 07 47 West | 2182 kHz (Radiotelephony) 2142 kHz (Radiotelephony) 2206 kHz (Radiotelephony) |
| | | |

| | | |
|-------------------------------|---------------------------------|---|
| Rivière au Renard (Québec) | 49 00 29 North 64 24 00 West | 2182 kHz (Radiotelephony) 2118 kHz (Radiotelephony) 2206 kHz (Radiotelephony) |
| Cap aux Meules (Québec) | 47 23 14 North 61 51 40 West | 2182 kHz (Radiotelephony) 2118 kHz (Radiotelephony) 2206 kHz (Radiotelephony) |
| Natashquan (Quebec) | 50 08 40 North 61 48 00 West | 2182 kHz (Radiotelephony) 2206 kHz (Radiotelephony) |
| Iqaluit (Nunavut) | 63 43 42 North 68 33 00 West | 2182 kHz (Radiotelephony) 2206 kHz (Radiotelephony) 4071 kHz (Radiotelephony) 4125 kHz (Radiotelephony) 4177.5 kHz (Narrow Band Direct Printing) 4207.5 kHz (Digital Selective Calling) 6206 kHz (Radiotelephony) 6215 kHz (Radiotelephony) 6268 kHz (Narrow Band Direct Printing) 6312 kHz (Digital Selective Calling) 8228 kHz (Radiotelephony) 8291 kHz (Radiotelephony) 8376.5 kHz (Narrow Band Direct Printing) 8414.5 kHz (Digital Selective |

| | | |
|----------------------------|---------------------------------|--|
| | | Calling) 12230 kHz (Radiotelephony) 12290 kHz (Radiotelephony) 12520 kHz (Narrow Direct Direct Printing) 12577 kHz (Digital Selective Calling) 16420 kHz (Radiotelephony) 16695 kHz (Narrow Band Direct Printing) 16804.5 kHz (Digital Selective Calling) |
| Killinek (Nunavut) | 60 25 27 North 64 50 30 West | 2182 kHz (Radiotelephony) 2118 kHz (Radiotelephony) 2206 kHz (Radiotelephony) 4071 kHz (Radiotelephony) |
| Coral Harbour (Nunavut) | 64 08 58 North 83 22 22 West | 2182 kHz (Radiotelephony) 2118 kHz (Radiotelephony) 2206 kHz (Radiotelephony) 4071 kHz (Radiotelephony) 6212 kHz (Radiotelephony) |
| Resolute Bay (Nunavut) | 74 45 14 North 94 58 09 West | 2182 kHz (Radiotelephony) 2206 kHz (Radiotelephony) 4071 kHz (Radiotelephony) 4125 kHz (Radiotelephony) 4177.5 kHz (Narrow Band Direct Printing) |

| | | |
|-----------------------------------|---|--|
| | | <p>4207.5 kHz (Digital Selective Calling)</p> <p>6215 kHz (Radiotelephony)</p> <p>6268 kHz (Narrow Band Direct Printing)</p> <p>6312 kHz (Digital Selective Calling)</p> <p>8267 kHz (Radiotelephony)</p> <p>8291 kHz (Radiotelephony)</p> <p>8376.5 kHz (Narrow Band Direct Printing)</p> <p>8414 kHz (Digital Selective Calling)</p> <p>12290 kHz (Radiotelephony)</p> <p>12520 kHz (Narrow Band Direct Printing)</p> <p>12577 kHz (Digital Selective Calling)</p> <p>16420 kHz (Radiotelephony)</p> <p>16695 kHz (Narrow Band Direct Printing)</p> <p>16804.5 kHz (Digital Selective Calling)</p> |
| Churchill (Manitoba) | <p>58 45 42 North</p> <p>93 56 39 West</p> | <p>2182 kHz (Radiotelephony)</p> <p>2206 kHz (Radiotelephony)</p> <p>4083 kHz (Radiotelephony)</p> |
| Inuvik (Northwest Territories) | <p>68 19 26 North</p> <p>133 35 00 West</p> | <p>2182 kHz (Radiotelephony)</p> <p>2142 kHz (Radiotelephony)</p> <p>4071 kHz (Radiotelephony)</p> |

| | | |
|--------------------------------------|----------------------------------|--|
| | | 5803 kHz (Radiotelephony) 6200 kHz (Radiotelephony) 6218.6 kHz (Radiotelephony) 8270 kHz (Radiotelephony) 12269 kHz (Radiotelephony) |
| Cambridge Bay (Nunavut) | 69 06 47 North 105 00 55 West | 2182 kHz (Radiotelephony) 2142 kHz (Radiotelephony) 4071 kHz (Radiotelephony) |
| Coppermine (Nunavut) | 67 49 30 North 115 06 30 West | 2182 kHz (Radiotelephony) 2142 kHz (Radiotelephony) 4071 kHz (Radiotelephony) |
| Hay River (Northwest Territories) | 60 50 00 North 115 47 00 West | 4071 kHz (Radiotelephony) 5803 kHz (Radiotelephony) 6200 kHz (Radiotelephony) 6218.6 kHz (Radiotelephony) 8270 kHz (Radiotelephony) |
| Prince Rupert (British Columbia) | 54 17 51 North 130 25 06 West | 2182 kHz (Radiotelephony) 2054 kHz (Radiotelephony) 4125 kHz (Radiotelephony) |
| Hunter Point (British Columbia) | 52 34 45 North 128 33 45 West | 2182 kHz (Radiotelephony) 2054 kHz (Radiotelephony) |
| Amphitrite Point | 48 55 31 North | 2182 kHz (Radiotelephony) |

| | | |
|--------------------|----------------|--|
| (British Columbia) | 125 32 25 West | 2054 kHz (Radiotelephony) 4125 kHz (Radiotelephony) |
|--------------------|----------------|--|

Annex B

Department of National Defence

Excluded Bands

DND believes that emergency frequencies (such as but not limited to 500, 2182 kHz), Radio Time Standard frequencies (such as but not limited to 5000, 10000 kHz), Radio Astronomy, Radionavigation, and all the Aeronautical frequency bands (Route and Off-Route as per the Canadian Table of Frequency Allocations) should be avoided by BPL systems.

Exclusion Locations

1. DND on behalf of the Government of Canada operates sensitive receiving facilities and radio direction finding stations in performing its Signals Intelligence (SIGINT) mission in the HF, VHF, and UHF spectrum. The target signals are often extremely weak, and many are designed to evade detection.

DND's approach follows National Security Agency's, and concurs that emissions from Access BPL in the range 1.8 MHz through 3 GHz shall not exceed those prescribed in Figure 1 when measured at DND's sensitive receiving facilities and radio direction finding stations.

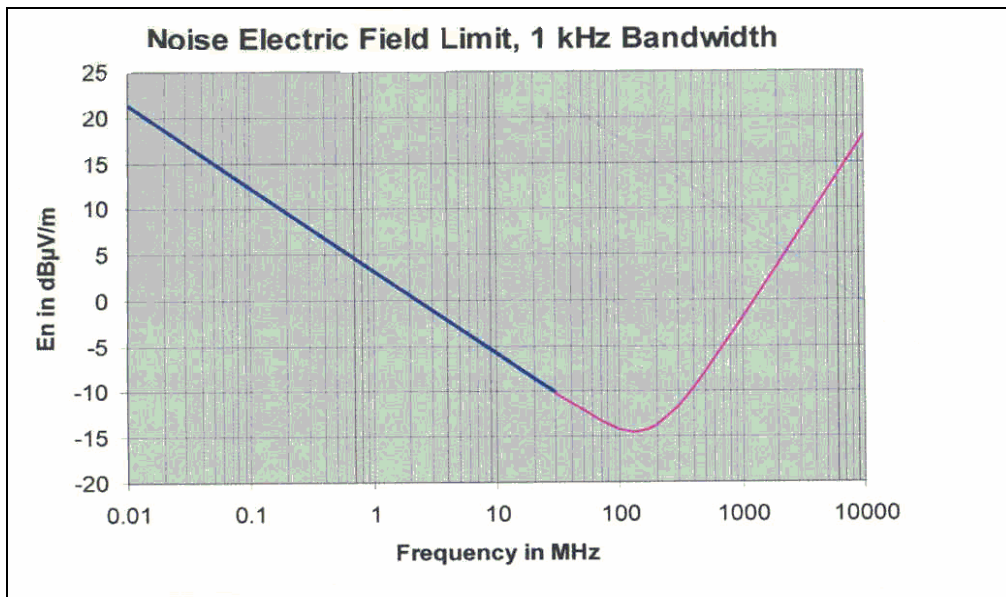


Figure 1

In order to achieve the above levels in Figure 1, DND is in agreement with FCC Part 15 Para 15.615 (F) (3)(i)(C), and requests a **complete** Exclusion Zone radius of 4 km around the following land stations' outer perimeter of the receiving antenna:

| | |
|---------------------------|------------------|
| Alert, Nunavut | 823030N 0622000W |
| Gander, Newfoundland | 485636N 0543433W |
| Leitrim (Ottawa), Ontario | 452000N 0753500W |
| Masset, British Columbia | 540100N 1320600W |

2. Furthermore, Naval Coastal Stations, Aeronautical Stations, and other Land Stations require a protection radius of 1 km for specific radio channels (as per FCC Part 15.615 Para F (2)(i)). BPL operators wishing to install BPL systems within the radius of the following sites shall coordinate directly with DND in order to avoid our radiocommunication channels.

| | |
|------------------------------------|------------------|
| Aldergrove, British Columbia | 490445N 1222900W |
| Dartmouth, Nova Scotia | 444000N 0635300W |
| Mill Cove, Nova Scotia | 443300N 0640500W |
| Bagotville, Québec | 482000N 0715000W |
| Cold Lake, Alberta | 544400N 1100200W |
| Comox, British Columbia | 494300N 1245400W |
| Edmonton, Alberta | 533400N 1133800W |
| Greenwood, Nova Scotia | 445900N 0645900W |
| Inuvik, Northwest Territories | 681950N 1333507W |
| Iqaluit, Nunavut | 683220N 0634415W |
| North Bay, Ontario | 462200N 0792500W |
| Resolute Bay, Nunavut | 744425N 0950035W |
| Shearwater, Nova Scotia | 443800N 0632900W |
| Tofino, British Columbia | 490249N 1254210W |
| Trenton, Ontario | 440700N 0773200W |
| Winnipeg, Manitoba | 495400N 0971400W |
| Yellowknife, Northwest Territories | 623014N 1141654W |
| Borden, Ontario | 442600N 0795800W |
| Calgary, Alberta | 510700N 1140100W |
| CFARS Valcartier, Québec | 465100N 0715000W |
| CFARS Kingston, Ontario | 441400N 0762700W |
| Debert, Nova Scotia | 452400N 0634300W |
| Edmonton, Alberta | 534705N 1133215W |
| Hamilton, Ontario | 431648N 0795115W |
| Nanaimo, British Columbia | 491600N 1241300W |
| Ottawa, Ontario | 445600N 0764500W |
| Red Deer, Alberta | 521622N 1144740W |
| Regina, Saskatchewan | 503031N 1043015W |
| Sherbrooke, Québec | 452400N 0715500W |
| Thunder Bay, Ontario | 482645N 0891323W |
| Toronto, Ontario | 433803N 0792409W |
| Vancouver, British Columbia | 491000N 1230500W |
| Winnipeg, Manitoba | 494500N 0971000W |

Annex C

Transport Canada

Excluded Frequencies

HF Frequencies assigned to the Maritime-Mobile Service according to the Manual for Use by the Maritime-Mobile and Maritime-Mobile Satellite Service.

| Frequency Band (kHz) | Frequency Band (kHz) | Frequency Band (kHz) |
|----------------------|----------------------|----------------------|
| 2065-2107 | 6200-6525 | 18780-18900 |
| 2170-2173.5 | 8100-8195 | 19680-19800 |
| 2190.5-2194 | 8195-8815 | 22000-22855 |
| 4000-4063 | 12230-13200 | 25070-25210 |
| 4063-4438 | 16360-17410 | 26100-26175 |

Maritime-Mobile frequencies assigned for Distress, Safety and Promulgation of MSI

| Freq. (kHz) | Usage | Freq. (kHz) | Usage | Freq. (kHz) | Usage |
|-------------|----------|-------------|-------|-------------|-------|
| 2174.5 * | NBDP | 6215 * | R/T | 12577 * | DSC |
| 2182 * | R/T | 6268 * | NBDP | 12579 * | MSI |
| 2187.5 * | DSC | 6312 * | DSC | 16420 * | R/T |
| 3023 | Aero/SAR | 6314 | MSI | 16695 * | NBDP |
| 4125 * | R/T | 8291 * | R/T | 16804.5 * | DSC |
| 4177.5 * | NBDP | 8376.5 * | NBDP | 16806.5 | MSI |
| 4207.5 * | DSC | 8414.5 * | DSC | 19680.5 | MSI |
| 4209.5 | MSI | 8416.5 | MSI | 22376 | MSI |
| 4210 | MSI | 12290 * | R/T | 26100.5 | MSI |
| 5680 | Aero/SAR | 12520 * | NBDP | — | -- |

* According to ITU-RR, any emission capable of causing harmful interference to distress, alarm, urgency or safety communications on these frequencies is prohibited.

NBDP = Narrow band direct printing

COM = Communication

RT= Radiotelephony

DSC = Digital Selective Calling

Aero/SAR = Aeronautical Search and Rescue

MSI = Marine Safety Information

ANNEX D

Canadian Broadcasting Corporation

Table 1 lists the frequencies used by CBC/Radio-Canada. They must be excluded from BPL operations to protect the broadcasting services.

| Service | Frequency Bands Used |
|---|----------------------|
| HF Broadcasting – Shortwave Radio and DRM | 5900 - 6200 kHz |
| | 7100 - 7350 kHz |
| | 9400 - 9900 kHz |
| | 11600 - 12100 kHz |
| | 13600 - 13800 kHz |
| | 17480 - 17900 kHz |
| | 18900 - 19020 kHz |
| | 21450 - 21850 kHz |
| 25670 - 26100 kHz | |
| Television | 54 - 88 MHz |

Table 1: Excluded frequencies to protect broadcasting operations

Table 2 lists the frequencies used by CBC/Radio-Canada that require protection from BPL harmonic and intermodulation frequencies.

| Service | Frequency Bands Used |
|-----------------|----------------------|
| AM Broadcasting | 535 - 1705 kHz |
| FM Broadcasting | 88 - 108 MHz |

Table 2: Additional frequencies requiring protection

Annex E

Radio Amateurs of Canada

Frequencies to be Avoided Notched Out

Canadian Amateur Radio Frequency Allocations HF and Low VHF

HF BANDS

| <i>BAND (Meters)</i> | <i>Frequencies (Mhz)</i> |
|----------------------|--------------------------|
| 160 | 1.8 - 2.0 |
| 80 | 3.5 - 4.0 |
| 40 | 7.0 - 7.3 |
| 30 | 10.1 - 10.15 |
| 20 | 14.0 - 14.350 |
| 17 | 18.068 - 18.168 |
| 15 | 21.0 - 21.450 |
| 12 | 24.890 - 24.990 |
| 10 | 28.0 - 29.7 |

LOW VHF BAND

| | |
|---|-------------|
| 6 | 50.0 - 54.0 |
|---|-------------|

Rationale: The majority of Amateur Radio Stations in urban areas are located on residential lots generally no more than 100' (30 metres) by 50' (15 metres). In addition, these lots can have medium voltage (MV) power lines running across both the front and back of the lots. It would not be possible to erect an antenna more than 15 metres from either of these power lines situating the antenna well within the 30 uV/m @ 30 metres coverage of the emission limits proposed by IC. These emission limits are 26.2 and 29.2 dB above the man made noise as measured by Industry Canada's Communications Research Center (CRC) for Montreal and Ottawa respectively. The median man made noise levels reported by CRC are:

| <i>Frequency Mhz</i> | <i>Measured results in Montreal urban areas</i> | <i>Measured results in Ottawa urban areas</i> |
|----------------------|---|---|
|----------------------|---|---|

| <i>Frequency Mhz</i> | <i>Measured results in Montreal urban areas</i> | <i>Measured results in Ottawa urban areas</i> |
|----------------------|---|---|
| 10 | 3.3(dBuV/m) or 1.46 uV/m | 0.3(dBuV/m) or 1.04 uV/m |
| 25 | 2.3(dBuV/m) or 1.3 uV/m | -3.7(dBuV/m) or 0.65 uV/m |

HF is used by Amateur Radio operators for weak-signal communications in which signals frequently vary from “strong” to barely above “atmospheric/galactic noise” or receiver noise. Although atmospheric/galactic noise varies in strength from hour to hour and season to season, Amateur Radio operators can avoid this noise by changing operating times, frequencies or changing their antenna. BPL noise, on the other hand, is continuous and cannot be avoided by the Amateur Radio operator.

At MF and low HF, amateur Radio operators have no options in the orientation of their antennas. In general, man-made noise is the limiting factor in HF weak signal communications, especially in urban areas. For all of these reasons, 1 uV/m measured at 30 metres should be the maximum field strength for BPL unintentional emissions allowed on HF frequencies.