Canadian Electricity Association | Association canadienne de l'électricité

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Subject: **Canada Gazette Notice No. SLPB-006-17 published 2017-10-21: Consultation on the Spectrum Outlook 2018-2022**

1.0 Introduction

Pursuant to the instructions set out in paragraph 168 of Canada Gazette Notice No. SLPB-006-17, Consultation on the Spectrum Outlook 2018-2020, as published October 21, 2017, as revised December 20, 2017, the following comments are submitted by the utility member companies of the Canadian Electricity Association (hereinafter "CEA").

1.1 Canadian Electricity Association (CEA)

Founded in 1891, CEA is the national forum and voice of the evolving electricity business in Canada. CEA members generate, transmit, and distribute electrical energy to industrial, commercial, residential, and institutional customers across Canada. Members include integrated electric utilities, independent power producers, transmission and distribution companies, power marketers, manufacturers and suppliers of materials, technology, and services. CEA strives to deliver compelling and coherent industry viewpoints to decision makers on critical policy and regulatory issues.

2.0 The Need for Radio Spectrum

The electrical infrastructure that Canadian electric utilities operate is critical to the safety, security and smooth functioning of Canada's economy. As reliance on the grid has grown, and the complexity of the generation and distribution systems increase, resilient communication networks are becoming increasingly vital for the safe and reliable operation of the electric grid and the delivery of affordable electricity. Electric utilities use

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telecommunications networks to: (i) maintain secure and dependable tele-protection systems, (ii) monitor and control electric infrastructure, (iii) enable the safe and efficient dispatch of their field workforce for routine and recovery operations, and (iv) monitor and manage water resources for hydro-electric generation and flood mitigation (an activity that takes on more importance as climate change introduces new uncertainties). Often radio spectrum is the most cost effective medium for these networks.

Accordingly, Canadian Electric Utilities (CEUs) have invested heavily in wireless communications. To protect existing CEU investments and to facilitate sustainability, the Canadian Electricity Association advocates the following positions:

1. Maintain protection of the 7 GHz band for CEU transport networks (backhaul), and re-establish preferred access.
2. Maintain allocation of 1.8 GHz band for CEU access networks.
3. Revise the license fee structure for bands suitable for telemetry including 1.8 GHz.
4. Maintain protection for C-band and Ku-band fixed satellite service.
5. Facilitate access to 3GPP band spectrum where there is a thriving ecosystem of equipment and services.
6. Allocate more license-exempt spectrum in bands suitable for the industrial Internet of Things.

Our comments to the consultation questions explain the basis of these positions. Our intention is to draw the attention of the Department to the current and evolving need for usable radio spectrum by CEUs.

3.0 Response to Consultation Questions

3.1 Question # 3 – Technology Developments & Usage Trends

Question: *What new technology developments and/or usage trends are expected to address traffic pressures and spectrum demand for commercial mobile services? When are these technologies expected to become available?*

Answer: The ongoing evolution of 3GPP specifications for LTE systems and emerging 5G technology, has led to more use cases and more business models for these open global network technologies. Private networks based on these specifications are emerging and

require more access to LTE bands. The Department should facilitate this access. Specific policy measures include:

- Encourage sharing of public safety spectrum allocations with critical infrastructure entities.
- Make provisions for the above measures to improve the economics of deployment in rural areas.
- Allow wideband (200 kHz) channels for Narrowband Internet of Things (NB-IoT) in guard bands for LTE spectrum below 1 GHz.

Making more mobile spectrum available to commercial operators is not the only means to respond to the growth in mobile demand. As 3GPP technology becomes more common, CEUs as well as other industrial and enterprise users are in a position to deploy networks to meet their requirements. Often due to property right-of-way, backup power, security, and local access needs, these users are in the best position to build these networks.

CEA notes that there is a lot of "inactive" spectrum held by mobile network operators (MNOs), particularly in rural areas. Allowing more flexibility for private and critical infrastructure groups to access spectrum resources would help alleviate this under utilization. Access to this spectrum and use of 3GPP technology requires access to International Mobile Subscriber Identity (IMSI) resources. IMSI assignments can also improve Machine-Type- Communications (MTC) reliably and efficiency by allowing access to multiple Radio Access Networks (RANs).

3.2 Question # 5 – License Exempt

3.2.1 Question 5

Question 5: Do you agree with the above assessment of demand for licence-exempt spectrum in the next few years? Is there additional information regarding demand, which is not covered above, that should be considered? If so, please explain in detail.

Answer: CEA agrees with the demand assessment in general terms and wishes to reinforce the growing need for license-exempt spectrum for the industrial Internet of Things (IoT), in particular for CEUs. Grid automation will continue to expand into the distribution system, enabling integration of distributed energy resources (including and especially renewable

resources) and facilitating system reliability and safety. There will be more sensors and actuators and more traffic with these field devices. License-exempt can meet some of these needs and is often used because (i) there is low cost equipment available in these bands, and (ii) these bands are not constrained by onerous licensing processes or costly fees. License-exempt is also commonly used in rural Canada, where there are less customers, less interference, and less return on investment to pursue more-costly licensed options.

CEA notes that commercial communication service providers (CSPs) are increasingly using license-exempt spectrum to add to their networks, for example through Voice over Wi-Fi integration and LTE License Assisted Access (LTE-LAA) technology. This puts further pressure on license-exempt bands, to the detriment of current users. A significant advantage of license-exempt technologies, such as Wi-Fi, is that it allows the industrial and enterprise users to economically deploy networks suited to their needs (e.g., in terms of coverage, security and quality of service).

In addition to Wi-Fi, MulteFire is emerging. Specifications have been issued by the MulteFire Alliance to enable LTE technology to be deployed in license-exempt bands. Unlike LTE-LAA, which mediates access to the license-exempt bands, MulteFire does not require anchoring on a license. LTE-LAA has some benefits over MulteFire, in particular the ability of LTE-LAA to fallback to protected spectrum.

To deploy LTE-LAA and gain these benefits, industrial users require access to licensed 3GPP spectrum. As noted above, access to 3GPP spectrum by CEUs can improve spectrum utilization and contribute to the public good. It also has the potential advantage of unifying communications across a corporate body, and contributing to efficiency, reliability and security.

3.2.2 Question 6

Comment on Question 6: *What new technologies and/or sharing techniques are expected to aid in relieving traffic pressures and addressing spectrum demand for licence-exempt applications? When are these technologies expected to become available?*

Answer: Software defined radio and cognitive radio technologies continue to improve enabling various spectrum sharing mechanisms as the channel can be automatically and dynamically selected in response to interference levels.

Previously license-exempt spectrum has been allocated to specific services (e.g. wireless microphones). Given the migration to Internet Protocol which supports a full range of services, the Department should consider allowing all uses of license-exempt spectrum provided they meet the spectrum occupancy and emission regulations. License-exempt spectrum enables volume markets that lower costs.

3.2.3 Question 7

Question Q7: *What existing licence-exempt frequency bands will see the most evolution in the next five years? Are there any IoT applications that will have a large impact on the existing licence-exempt bands? If so, what bands will see the most impact from these applications?*

Answer: CEA anticipates continued deployment of smart metering in the 915 MHz band by CEUs. Usage, in terms of traffic levels, will only increase as applications evolve and new applications are introduced to improve power system utilization and efficiency. Additionally, electricity customers (industrial, commercial, and residential), are increasingly investing in customer generation and energy management, and making use of license-exempt spectrum for monitoring, automation, and control of these applications. Spectrum below 1 GHz is preferred for field automation due to its favorable propagation characteristics. There is a relationship between Smart Grids and Smart Cities, and CEUs are seeing an increase in municipal networks as well. Evolving technologies for IoT are enabling the collection, analysis and exploitation of extensive amounts of data.

3.3 Satellite

3.3.1 Question 9

Question Q9: *ISED is seeking comments on the above demand assessment for MSS and earth observation applications for the period 2018-2022. Is there additional information on demand, which is not covered above, that should be considered?*

Answer: CEUs use L-band satellite for communications to pole-top mounted intelligent electronic devices in remote areas. This band is favored because the antennas can tolerate the typical movement experienced by pole mounted devices and the band can tolerate most weather conditions. Demand will increase as distribution automation spreads and as MSS services evolve to better serve machine type communications, including appropriate service fee structures. Although this demand is modest compared to other services, its importance cannot be overstated. Congestion would jeopardize existing investments and incur higher costs as less economical solutions would be required.

In addition, CEA would like to highlight other satellite bands that are important to CEU operations. The Geostationary Operational Environmental Satellite system (GOES), operated by the United States' National Oceanic and Atmospheric Administration's (NOAA), supports weather forecasting, severe storm tracking, the transmission of data from land-based environmental monitoring stations and meteorology research. This service uses uplinks in the 401 to 403 MHz band, coupled with downlinks in the 1675 to 1695 MHz band. Improvements in technology capabilities are allowing for improved sensing and more efficient use of this spectrum. In recent years there have been pressures on the 1675 to 1695 MHz band by neighboring PCS I Block, and AWS 3, as well as petitions for shared access by Ligado (formerly LightSquared). Additionally, in the 401 to 403 MHz band there has been increased demand due to an increase in small, inexpensive, spacecraft deployed in large constellations by Planet Labs and Spire.

Federal and provincial agencies in Canada, as well as critical infrastructure utilities such as the CEUs, use this service to transmit environmental data from remote locations. This enables them to gain a detailed understanding of the status of atmosphere and hydrosphere, and specifically to manage natural hazards such as flooding. Further, due to its reliability this service is important to CEUs for the monitoring and management of water systems necessary to generate hydro-electric power. One of the limitations of the GOES system is its low transmission frequency for the general user. However, for timely management of rapidly changing environmental conditions, such as extreme weather and floods, it would be highly desirable to increase the GOES transmission bandwidth and thereby transmission frequency.

3.3.2 Question 10

Question Q10: *ISED is seeking comments on the above demand assessment for FSS/BSS for the period 2018-2022. Is there additional information on demand, which is not covered above, that should be considered with regards to the below bands? (a) C-band; (b) Ku-band; and (c) Ka-band.*

Answer: CEUs will continue to use C-band and Ku-band satellite. There will be some growth in the number of sites as improved monitoring and control of remote generation and transmission sites drives higher bandwidth solutions. There will also be bandwidth growth from new applications and from increased data usage on existing applications.

3.4 Backhaul

3.4.1 Question 14

Question Q14: *Backhaul service in Canada is delivered using a variety of solutions, including fibre optics, microwave radio and satellites. What changes, if any, are anticipated to the mix of backhaul solutions employed?*

Answer: CEA sees increasing demand for all backhaul network media, driven by the above mentioned ongoing power grid automation. Although optical fiber is preferred for capacity and performance reasons, it is relatively expensive and requires route diversity to meet CEU availability requirements. Where costs can be justified, optical fiber routes will be deployed. However, microwave will continue to be important, including as a diversity route for fiber. CEA wishes to reinforce the ongoing need and importance of 7 GHz band for utility operations. Priority access to this band facilitates coordination between utilities and it has enabled consistent channel assignments, which improves sparing. There is a competitive supply of high power and high capacity radios optimized for CEU needs available for this band.

An ongoing concern is the high cost of licensing high capacity microwave systems. License fee structures should not discourage the use of these high efficiency systems. A more progressive fee structure that is graduated by capacity is recommended.

3.4.2 Question 17

Question 17: *Is there a range or ranges of frequencies that will be in higher demand over the next five years? Why is higher demand anticipated for these frequency ranges?*

Answer: There will be increased CEU investment in electric supply protection, automation and control, and this will drive increased demand for the 7125-7725 MHz microwave band. There will be increased CEU demand for rural monitoring and control that will drive increased demand for C-Band satellite.

3.5 Potential Frequency Bands

3.5.1 Question 20

Question Q20: *ISED is seeking comments on the potential frequency bands for release in table 7 covering (a) the proposed services and/or applications for each frequency band; (b) the potential timing of releasing for each frequency band; and (c) the priority of the release of the frequency bands. re: b) 896-960 MHz (900 MHz)*

Answer: Regarding the 896-960 MHz (900 MHz) band. CEA favors increasing the amount of license-exempt spectrum in this band because the band: (i) has favorable propagation characteristics in rural and urban environments; and (ii) it is close to the existing 915 MHz license-exempt band, and therefore it will be cost effective to develop chipsets and hardware in adjacent bands. This will lead to low cost equipment for industrial Internet of Things applications and avoids the onerous process and licensing fees associated with licensed spectrum.

3.5.2 Question 21

Question Q21: *Are there any other bands that should be considered for release in the next five years for commercial mobile, fixed, satellite, or licence-exempt that are not discussed above? Provide rationale for your response.*

Answer: CEA recommends increasing the stock of license-exempt spectrum (i) by expanding into bands adjacent to existing license-exempt bands and (ii) by adopting license-exempt bands from other regions (for example 868 MHz, 466 MHz, 475 MHz and 950 MHz). In particular, the lower frequency bands are preferred for license-exempt Industrial IoT uses due to their favorable propagation characteristics in cluttered urban and rural environments.

By expanding existing license-exempt bands manufacturers can reuse existing products with minor modifications while still taking advantage of regional and global ecosystems to justify their business cases.

Similarly, adopting license-exempt bands from other regions increases the global footprint and potential market, resulting in more technically advanced, lower cost, sustainable products.

As 3GPP pursues license-exempt LTE and Listen-Before-Talk requirements, pairing 950 to 960 MHz with the existing 902 to 928 MHz license-exempt band, may enable use of low power Band 8 LTE equipment on a license-exempt basis. As there is an increasing demand for private LTE for industrial IoT users, this may enable further technology and network consolidation maximizing the innovation investment. While 915 MHz Wi-Fi is also being pursued, there are technical advantages to LTE resulting in a more secure, reliable and predictable service.

3.5.3 Question 22

Question 22: *Are there specific frequency ranges/spectrum bands that should be made available for specific applications?*

Answer: The 1800-1830 MHz spectrum allocation for Smart Grids: The provisions for the management of the electric supply afforded in SRSP 301.7 should be retained with technical rules, fee structures and licensing processes commensurate with the importance of this critical service.

The Department should consider population based fee structures similar to those previously established for electricity telemetry and public safety. Such a fee structure is in

place for electricity telemetry and automatic meter reading in the L-band at 1427 MHz. Having such a fee structure for the 1800-1830 MHz band would offer greater opportunities.

Consistent with the backhaul consultation, CEUs would benefit from a relaxation of the terminal antenna rules in the 1800-1830 MHz band. Smaller antennas would allow: (i) line mounted sensors, safer mounting in close proximity to electrical equipment and lines, and (ii) improves system reliability when used with multiple base stations.

CEA fully supports the railway association request for 600 MHz or suitable spectrum to enable their critical railway operation mandate. If the Department allocates 5+5 MHz for railway operations CEA believes the same block should be made available to other critical infrastructure operations on a secondary basis using a categorization approach (RP-25) and fee structure ($/pop/MHz) similar to that which is used for public safety.

3.5.4 Question 23

Question Q23: *Are there any factors that would impact the potential release of these frequency bands between 2018 and 2022?*

Answer: Spectrum auctions are generally problematic for critical infrastructure users. While the advantages of auctions are recognized by CEA, mechanisms need to be in place to safeguard access to adequate and appropriate spectrum for critical infrastructure purposes. Provisions should be in place for blocks of spectrum that are auctioned to: (i) avoid spectrum hoarding, especially in rural areas; and (ii) allow for the transfer of rights for other uses and other users. The emergence of technology and licensing regimes that enable dynamic spectrum sharing may have a role to play.

CEA notes there is a growing trend towards the Internet of Things and Everything over IP. Recognizing that IP networks can flexibly transport any service, spectrum allocations should not unduly constrain the services that can be carried. Another impact for CEUs and other critical infrastructure operators that rely on telemetry systems, the trend toward IP shifts our need from discrete narrowband RF channels to wideband and even broadband channels. Although CEUs are focusing on the 1815 MHz band for licensed broadband, telemetry applications benefit from the better propagation characteristics of lower frequencies, particularly for rural deployments. The recent ratification of NB-IoT

specifications by 3GPP is of interest as NB-IoT is based on 200 kHz wideband channels. These channels can be implemented in LTE guard bands, providing flexibility and improving overall spectrum utilization. An equipment ecosystem is forming around this standard. Private NB-IoT is a significant opportunity for CEUs ongoing deployment of smart metering and smart grid infrastructure, and NB-IoT channels in the 600 MHz would be particularly useful.

CEA is encouraged by the interest in sharing public safety broadband network (PSBN) spectrum with critical infrastructure entities. As this mutually beneficial opportunity progresses, consideration should be given to applying elements of the PSBN model to the public safety spectrum at 4.9 GHz.

In terms of incumbent radio systems that are essential for operations, CEA confirms that existing VHF and UHF spectrum used for CEU land mobile radio applications will continue to be required across the 5-year spectrum outlook, and beyond.

All of which is respectfully submitted.

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