Corridor Communications Inc. Comments

Innovation, Science, and Economic Development Canada
Consultation on the Spectrum Outlook 2018 to 2022
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cci wireless
perfecting rural connectivity

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Corridor Communications Inc., operating as CCI Wireless ("CCI"), appreciates the opportunity to provide comments on the issues raised under SLPB-006-17 – Consultation on the Spectrum Outlook 2018 to 2022 ("the Consultation").

Under the Consultation, Innovation, Science and Economic Development Canada ("ISED") seeks comments on its overall approach and planning activities related to the release of spectrum for commercial mobile services, license-exempt applications, satellite services and wireless backhaul services over the years 2018 to 2022.

CCI is currently the second-largest wireless internet service provider (WISP) in Canada and is operated out of the organization's head office in Calgary, Alberta. The business supports the universal service objective and believes the key components to meeting that objective is access to spectrum that facilitates service in rural and remote regions of Canada and government policies that facilitate the efficient and expedited deployment of infrastructure in those regions.

CCI's submission seeks to provide ISED with our perspective on how the overall approach and planning activities related to the release of spectrum can facilitate greater broadband access to a larger percentage of the rural and remote populations of Canada.

CCI responds below to ISED's 23 questions on its proposed framework for the spectrum releases contemplated under this Consultation.

Q1 – What future changes, if any, should ISED examine with regard to the existing licensing regime to better plan for innovative new technologies and applications and allow for benefits that new technology can offer, such as improved spectrum efficiency?

> CCI believes that ISED should make several key changes to the existing licensing regime to better plan for innovative new technologies and applications and allow for the benefits that new technology can offer. These modifications will accelerate radio equipment deployments, facilitating the realization of the stated objective of seeking to maximize the economic and social benefits that Canadians derive from the use of the radio frequency spectrum resource.
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> The first adjustment should be declaring that any spectrum designated for commercial mobile services or fixed wireless access, as usable for both applications.
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> The similarity of the network architecture and equipment in both a commercial mobile and a fixed wireless access deployment supports the two services existing within a relatively close geographical area.
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> Once spectrum for commercial mobile services and fixed wireless access are recognized as usable for both applications, CCI believes that the next second should be to extend the Framework for Mandatory Roaming and Antenna Tower and Site Sharing (CPC-2-0-17) to mandate reciprocal access to spectrum by those parties in possession of spectrum designated for both applications.
>
> By implementing a reciprocal process, it facilitates the use of under utilized assets, allows for the benefits that new technology can offer as spectrum will no longer be a barrier to

deployment, and it ensures that all participants working together for an efficient radio frequency environment.

The following change should be accelerating deployment conditions for any new spectrum licenses purchased. The proposed 20-year deployment requirements should be realized within the first five years.

The current five year deployment thresholds are easily met by deployments that have no commercial intention. An example would be a single tower, with three 45 degree antennas broadcasting over the City of Calgary, will meet the proposed five year deployment threshold proposed for the 600 MHz band in Alberta service area 2-012, regardless of how many customers are using the service. By accelerating the deployment requirements, ISED will be encouraging only those that wish to provide service within the first five years, to purchase the spectrum licenses. It will remove the incentive to purchase spectrum for the purpose of holding the resource, which will make more spectrum available for the deployment of innovative new technologies and applications and allow for benefits that new technology can offer.

The subsequent alteration should be combining Licensing Term Provisions with Deployment Conditions, making both five years in length. Once the current 20-year deployment requirements become the revised five year deployment requirements, there will not be a need for Licensing Term Provisions that differ from Deployment Conditions.

In Alberta, mineral rights leases are issued for five year terms, with automatic renewals with proof of production. CCI believes it is a relevant comparison, given the capital-intensive nature of both the petroleum and the telecommunications industries, and demonstrates how a shorter licensing window can incentivize a more rapid utilization of crown assets.

The concern regarding increased financial risk associated with investing in telecommunications infrastructure when licensing terms are shortened is addressed through the license renewal process. As discussed in previous consultation papers, spectrum licenses that are being utilized have a high likelihood of renewal. If licensing terms are reduced to 5 years, those that have deployed capital to use the spectrum during that period should find themselves able to protect that investment through a high likelihood of renewal, mitigating the risk.

The final change CCI proposes is aligning license transferability periods with their applicable licensing terms. In doing so, license holders would not be able to transfer licenses within the first five years. However, those that meet the licensing requirements will be able to transfer the license after five years, subject to ISED's approval.

While it may be suggested that the changes proposed do not support an environment where a reasonable return on invested capital can be earned, CCI believes that more targeted spectrum purchases, combined with lower auction prices, will allow service providers to maintain their required hurdle rates.

In 2016, Canada's GDP was proximately $1.53 trillion USD. According to a report by the International Telecommunications Union titled Impact of Broadband on the Economy (April 2012), the average impact of broadband on GDP growth in medium penetration countries

(including Canada) is 0.014%. For high penetration countries, the average effect is 0.023%. The proposed changes in this document will undoubtedly lead to reduced auction proceeds, however, the transition from a medium penetration country to a high penetration country will generate approximately $138 million in additional GDP per year (based on 2016 figures). By facilitating a more diverse group of spectrum holders, ISED will drive increased broadband penetration, and the benefits of GDP growth, across Canada.

Q2 –Do you agree with the above assessment on demand for commercial mobile services in the next few years? Is there additional information on demand, which is not covered above, that should be considered? If so, please explain in detail.

CCI agrees with the assessment on demand for commercial mobile services in the next few years. While traditional use of mobile devices is getting close to its saturation point, increasing data consumption by existing mobile subscribers, and the proliferation of machine-to-machine connectivity, will drive exponential demand for commercial mobile services.

Q3 – 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?

CCI believes that the combination of network edge storage devices driven by predictive usage algorithms and decentralized network architecture driven by software define networking and network function virtualization (cloud computing) will be the developments that are expected to address traffic pressures and spectrum demand for commercial mobile services. For 5G specifically, network slicing architecture will reduce the signalling overhead on the core network.

These technology innovations will improve spectral efficiency and reduce interference while pushing processing activities closer to the end user and will facilitate network loading during "off-peak" times. Those activities will reduce sector occupancy and allowing greater practical throughput while utilizing the same spectral resource. In addition, these developments will enable the flexibility, scalability and efficiency of mobile cloud computing, IoT, social networking, which is difficult under the current LTE architecture.

While instances of decentralized network architecture have already been deployed for specific applications, CCI believes that it will be 24 months before more commercial uses appear in the market. It is expected to be 3 to 4 years be it is widely adopted. In addition, the first commercial instances of network edge storage devices driven by predictive usage algorithms will begin to be deployed within a similar timeframe.

Q4 – Recognizing the trend of increasing commercial mobile traffic, what operational measures (e.g. densification, small cells or advanced traffic management) are being taken to respond to, and support, increasing traffic? To what extent are these measures effective?

Recognizing the trend of increasing commercial mobile traffic, CCI believes that the only real effective operational measure is decreasing the aggregate distance between the subscriber

and the broadcasting radio. To reduce the distance, network densification, or the use of small cells, is required.

However, the inherent challenge with small cells would be cost and access to spectrum. CCI believes that rethinking the network architecture by enabling the use of software defined networking and network function virtualization in commercial mobile networks by moving the intelligence to the access point via a decentralized model would greatly improve the support for increased traffic demand.

Q5 – 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.

While CCI agrees that the demand for license-exempt spectrum will increase in the next few years, it is the augmentation of existing contention-based protocols (i.e. LTE and 5G), not the proliferation of IoT and Wi-Fi usage cases, that will be the catalyst.

In the instance of Wi-Fi, the current driver of demand is offloading commercial mobile traffic to wired connections that have excess capacity. As the demand for data over wireless networks continues to increase and as networks continue to densify, an increasing number of contention-based access points are going to be connected directly to a wired service, negating the need for an offloading mechanism.

In addition, to meet those data requirements, a more efficient use of the license-exempt spectral resource is needed. To support the more efficient use, manufacturers are developing chipsets to allow devices that are typically connected to Wi-Fi, to connect directly to an existing LTE network (i.e. Qualcomm Snapdragon Mobile PC Platforms).

For IoT, current demand is driven by the increasing number of devices. However, as is being seen with devices that would have typically connected using Wi-Fi protocol, manufacturers are developing chipsets to support wireless connectivity via contention-based protocols (ie. Narrow Band IoT and LTE-M). The approach would allow IoT devices to connect directly to existing LTE networks.

To support the shift in the use of license-exempt spectrum, manufacturers are developing LTE-U, license assisted access (LAA), and MulteFire access equipment to allow service providers to operate a single, standards-based network, instead of two separate networks (ie. Wi-Fi protocol and a contention-based protocol). A single network will allow a more ubiquitous connection experience and possible channel aggregation to support higher wireless bandwidth.

Q6 – 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?

As discussed in Q3, CCI believes that the combination of network edge storage devices driven by predictive usage algorithms and decentralized network architecture driven by software define networking and network function virtualization (cloud computing) will be the

developments that are expected to address traffic pressures and spectrum demand for license-exempt applications.

While instances of decentralized network architecture have already been deployed for specific applications, CCI believes that it will be 24 months before it more commercial uses appear in the market. It is expected to be 3 to 4 years be it is widely adopted. In addition, the first commercial instances of network edge storage devices driven by predictive usage algorithms will begin to be deployed within a similar timeframe.

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?

CCI believes the RLAN bands, as identified in Table 2 in this Consultation, will see the most evolution in the next five years.

As discussed in Q4, CCI does not see any IoT applications that will have a large impact on the existing license-exempt bands, specifically. Instead, IoT as product connectivity evolution, will have a large impact on all frequency bands.

Q8 – Will the trend for offering carrier-grade or managed Wi-Fi services continue to increase over the next five years? If so, will this impact congestion in Wi-Fi bands and which bands would be most affected?

The trend of offering carrier-grade or managed Wi-Fi services will increase over the next five years, but at a decreased rate. CCI believes that the emergence of an increasing number of devices that will connect directly to a contention-based network will be the cause.

Congestion in Wi-Fi bands will more likely be caused by the use of those bands for contention-based network deployments.

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?

CCI agrees with the demand assessment, for MSS and earth observation applications, put forward by ISED. CCI is not aware of any additional information on demand, which is not covered in this Consultation, that should be considered.

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
c) Ka-band

CCI believes the demand assessment for FSS/BSS in the C-band, Ku-band and Ka-band, for the period of 2018-2022, is an accurate reflection of market trends.

Q11 – What and how will technology developments and/or usage trends aid in relieving traffic pressures and addressing spectrum demand for satellite services? When are these technologies expected to become available?

As discussed in Q3, CCI believes that the combination of network edge storage devices driven by predictive usage algorithms and decentralized network architecture driven by software define networking and network function virtualization (cloud computing) will be the developments that are expected to address traffic pressures and spectrum demand for satellite services.

While instances of decentralized network architecture have already been deployed for specific applications, CCI believes that it will be 24 months before it more commercial uses appear in the market. It is expected to be 3 to 4 years be it is widely adopted. In addition, the first commercial instances of network edge storage devices driven by predictive usage algorithms will begin to be deployed within a similar timeframe.

Q12 – What satellite applications (e.g. broadband Internet, video broadcasting, backhaul, etc.) do you consider a priority for the period 2018-2022?

CCI considers broadband internet and backhaul to be the satellite applications that will be a priority for the period 2018-2022.

The demand for broadband connectivity and commercial mobile services in rural and remote areas of Canada, that cannot be cost-effectively serviced entirely by terrestrial means, are the primary drivers of the demand for those applications.

Q13 – Do you agree with the above assessment on demand for backhaul in the next five years? Is there additional information on demand, which is not covered above, that should be considered? If so, please explain in detail.

CCI agrees with the assessment on demand for backhaul in the next five years. CCI is not aware of any additional information on demand, which was not previously covered, that should be considered.

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?

CCI believes that given the current, and future, demand for both aggregate bandwidth and final mile wireless access, backhaul service in Canada will increasingly move towards fibre optic and high capacity microwave radio based solutions.

The perpetually increasing bandwidth demand will drive the need for higher capacity transport links due to 5G deployments that will have 4 times the capacity of comparable 4G sites. The cost associated with fibre optic backhaul deployments is high, which will drive an increase in microwave backhaul solutions over the short, to medium, term. However, final mile wireless access is going to put a strain on finite spectrum resources, driving both service

providers, and equipment manufacturers, to focus development and deployment efforts on wireless access, versus backhaul, technologies.

Q15 – What and how will technology developments and/or usage trends aid in relieving traffic pressures and addressing spectrum demand for backhaul services? When are these technologies expected to become available?

As discussed in Q3, CCI believes that the combination of network edge storage devices driven by predictive usage algorithms and decentralized network architecture driven by software define networking and network function virtualization (cloud computing) will be the developments that are expected to address traffic pressures and spectrum demand for backhaul services.

While instances of decentralized network architecture have already been deployed for specific applications, CCI believes that it will be 24 months before it more commercial uses appear in the market. It is expected to be 3 to 4 years be it is widely adopted. In addition, the first commercial instances of network edge storage devices driven by predictive usage algorithms will begin to be deployed within a similar timeframe.

Q16 – Will the demand for commercial mobile, licence-exempt, satellite, or fixed wireless services/applications impact the demand for backhaul spectrum? If so, how and which of these services/applications will create the most impact?

CCI believes that demand for commercial mobile, license-exempt, satellite, or fixed wireless services/applications will all have enormous impact on the demand for backhaul spectrum.

However, it is expected that the expansion of fixed wireless services/applications, both in licensed and licensed-exempt bands, will drive the largest increase in demand for spectrum currently designated for wireless backhaul.

While the historical use of fixed wireless as a connectivity medium in rural and remote areas of Canada will continue to expand as demand for bandwidth increases, the roll-out of 5G will cause a surge in the number of use cases for fixed wireless in more traditional urban markets (i.e. Connected cars, smart city applications, etc.). These applications will drive demand for larger channel sizes to drive higher thoughput for microwave backhaul solutions. The need for larger channel sizes will require ISED to revise the current costing model for backhaul spectrum licenses.

Q17 – 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?

CCI believes that due to the bands currently used for commercial mobile services in Canada and the development of equipment driven by the use of other bands in Europe, it is expected that spectrum in the following bands will be requested to be repurposed to allow for commercial mobile use; 953-960 MHz, 1700-1710 MHz, 1780-1850 MHz, and 2025-2110 MHz paired with 220-2285 MHz.

For the fixed wireless services/applications, especially in rural areas of Canada, the current equipment ecosystem and the development of 5G standards will drive significant demand for spectrum in the following bands; 3500-3700 MHz, 3700-4200 MHz, 5180-5835 MHz, 5925-6425 MHz, 25.25-26.5 GHz, 27.5-28.35 GHz, 38.4-38.6 GHz and 38.6-40 GHz.

Regarding spectrum demand for satellite use, the deployment of low-earth orbit (LEO satellites) networks to provide broadband connectivity to rural and remote areas of Canada are going to require spectrum in the Ku band (10-18 GHz) and Ka band (18-30 GHz).

Q18 – Will allowing flexible fixed and mobile services within the same frequency band change how backhaul is planned and used?

While CCI believes that allowing flexible fixed and mobile services within the same frequency will facilitate a more efficient use of spectrum assets, both from a deployment and cell occupancy standpoint, is it unlikely that approach would yield a change in how backhaul is planned and used.

As discussed throughout this application, regardless of the use of the wireless access, the traffic demand mitigation strategies are the same. From a technology standpoint, getting processing closer to the network edge and enabling more content to be accessed locally for consumption. From an operations standpoint, position the access radios closer to the user. Both tactics will result in lower latency and lower cell occupancy (draw on the spectrum resource) and will facilitate more efficient backhaul capacity planning.

Q19 – Provide, with rationale, your view of the above assessments on the bands being considered internationally for commercial mobile, fixed, satellite, or licence-exempt.

CCI agrees with the assessment of the bands being considered internationally for mobile, fixed, satellite, or license-exempt use.

Q20 – ISED is seeking comments on the potential frequency bands for release in table 7:

a) the proposed services and/or applications for each frequency band
b) the potential timing of releasing for each frequency band
c) the priority of the release of the frequency bands

Provide supporting rationale for your responses.

CCI agrees with the proposed services and/or applications for each frequency band in table 7.

The timing and priority for the release of the frequency bands should be driven by the establishment of 3GPP standards, the chipset availability to support devices, and the commercial availability of equipment in each band.

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.

CCI is not aware of any other bands that should be considered for release in the next five years for commercial mobile, fixed, satellite, or license-exempt applications, in addition to those that have been discussed in this consultation.

Q22 – Are there specific frequency ranges/spectrum bands that should be made available for specific applications?

CCI believes the specific applications identified for each frequency band are appropriate uses based on the ongoing 3GPP standard discussions and equipment ecosystems available.

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

CCI believes the only factor that would impact the potential release of these frequency bands would the advancement of 3GPP standards and the equipment ecosystems that would follow.

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