RADIO ADVISORY BOARD OF CANADA
CONSEIL CONSULTATIF CANADIEN DE LA RADIO

October 11, 2022

Chantal Davis
Senior Director, Spectrum Regulatory Policy
Innovation, Science and Economic Development Canada
235 Queen Street, 6th Floor
Ottawa, ON, K1A 0H5
(Submitted by email)

Subject: **SPB-003-22 - *Consultation on a Non-Competitive Local Licensing Framework, Including Spectrum in the 3900-3980 MHz Band and Portions of the 26, 28 and 38 GHz Bands***

Dear Chantal Davis,

Please find attached our response to the above noted consultation. This response was sent to RABC Sponsor Members for ballot. Of the Board's 21 Sponsor Members, 8 voted to approve (Bell, Canadian Association of Chiefs of Police, CanWISP, Canadian electronics and Communications Association, Department of National Defence, Model Aeronautics Association of Canada, Railway Association of Canada, and TELUS; 1 voted to abstain (NAV CANADA); and 1 voted to approve with comment (Rogers).

The Sponsor Members' comments (which form an integral part of the RABC response), are as follow.

<u>Rogers</u>
Rogers does not support NCL WBS licences operating at comparable power levels to SRSP-520. As per our own submission, we recommend similar power limits for the NCL 3900 MHz band, for urban and rural areas, as found in SRSP-303.65.

Rogers also recommends radius-based licensing for NCL licences. Using radius-based licensing will limit the coverage area of a site to a reasonable value, permitting the optimization of spectrum usage among multiple licensees, which is less possible with custom vector-based licensing. Use of custom vector-based licensing could potentially lead to inappropriate large coverage areas from a base station, which would negatively impact optimal sharing of spectrum among all licensees. Whichever area licensing method is adopted, it will be important that NCL

licence applicants provide a business plan with deployment commitments to avoid reserving spectrum that they do not intend to immediately use, potentially preventing access by alternative NCL licensees.

The Board appreciates the opportunity to respond to this important consultation.

Sincerely,

J. David Farnes
General Manager

Attachment

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Response to Question 2:
"ISED is seeking comments on the appropriate basis to establish local licence areas for the NCL licensing framework:

a. radius-based licence area (option 1)
b. a custom vector-based licence area (option 2)
c. some other method"

The RABC recommends that the department use custom vector-based license areas (option 2). Operators of NCL should be given the ability to craft the network they want to meet their needs which a custom vector-based licensing system will best allow. The reason for this is that a custom vector-based license area can be the shape the operator needs as opposed to a generic area set by a radius-based licensing area. It is already industrial best practice to deploy a directional antenna base station at points along the perimeter of the licensed area and direct the beams inward in such a way as to cover the whole license area but not overshoot the borders of the license area.

An additional benefit of putting stations up at the perimeter of an area is that signals from directional antennas would broadcast into buildings through walls, while signals from omnidirectional antennae on the roofs of buildings would have usually more significant materials barriers to provide connectivity, namely steel and concrete.

Another benefit of custom vector-based licensing is that more NCL users can exist adjacent to one another. This is owing to the geometry of license areas where vector-based polygons can be closer to one another without significant overlap or coverage gaps as would be the case for a border comprised of circular areas.

The RABC does recognize that the interference calculations for custom vector-based licensing are more complicated than radius-based licensing because vector-based polygons will be adjacent to one another, however, the benefits of a vector-based system outweigh those challenges.

Response to Question 3:
ISED is seeking comments on whether the same spectrum licensing areas should be used in all areas (i.e. urban, metro and rural and remote Tier 5 service areas), or if different licensing areas should be used (e.g. radius-based license areas in urban areas and custom vector-based license areas in rural and remote areas). Alternatively, should site-licensing be used in rural and remote areas?

The RABC recommends that custom vector-based licensing be used in all areas of Canada. The technical reason for supporting custom vector-based licensing is that users in remote areas may only require small, and or specifically shaped license areas, a hydro dam for example. Operators

of NCL should be given the ability to craft the network they want to meet their needs which a custom vector-based licensing system will best allow. For large, intended coverage areas, as are more likely the case in rural or remote locations, nothing prevents deployment using an omnidirectional antenna within a custom vector-based license area polygon. However, the use of a radius-based model in a rural and remote area would not provide the same flexibility as the one offered by custom vector-based licensing. As such custom vector-based licensing should be used throughout Canada regardless of metro, urban, rural, or remote designations.

Response to Question 4:
ISED is seeking comments on maximum permissible power levels and whether higher maximum permissible power levels should be used in rural or remote areas. If so, what maximum permissible power levels should be adopted in rural and remote areas?

Response to Question 4a:
If higher maximum permissible power levels in rural or remote areas are supported, ISED is seeking comments on the associated potential technical challenges (e.g. potential for interference between higher power systems and lower power systems operating in close proximity to each other in the same or adjacent frequency range).

In rural or remote areas, radio networks would benefit from being allowed to use higher maximum permissible power levels to improve coverage in NCL portions of 3900 MHz, 26/28 GHz, 38 GHz, and with similar mid/high bands. The maximum permissible power level could be similar to the one in SRSP-520 for the 3500 MHz band (and possibly in future SRSP for the 3800 MHz band) which is based on the 3GPP ecosystem. The maximum permissible power level in 26/28/38 GHz bands could also benefit from the power level in FCC standards. It should be noted however that use of a similar power level to SRSP for 3500 MHz would pose a challenge with using the tier 5 approach, due to radiowave propagation characteristics making it difficult in containing RF energy within the intended coverage area.

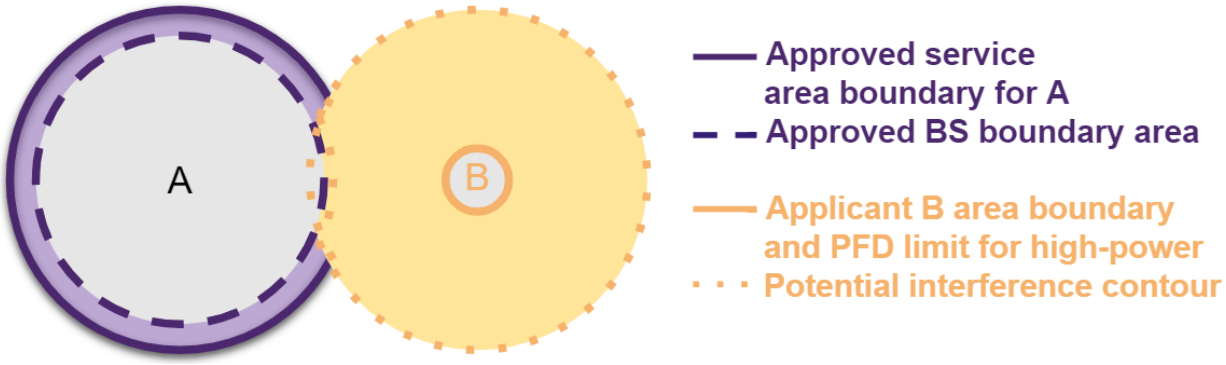
There are benefits and drawbacks to allowing higher maximum permissible power in rural and remote areas, due to potential interference and spectrum licensing inefficiencies resulting from mitigating interference techniques when implementing an automated licensing process. Further details of the benefits and drawbacks are provided in the response to Question 19.

Response to Question 6:
ISED is seeking comments on whether boundary conditions, such as implementing power flux density at the licence area boundary or limiting the deployment of base stations to a smaller area within the licence area (i.e. base station deployment areas), should be used. If specified base station deployment areas are used, how should they be determined?

RABC understands ISED intends to implement a simple NCL licensing process that may require little to no technical site information for NCL applicants and hence automated coexistence analysis would use the worst-case modelling and equipment technical specifications.

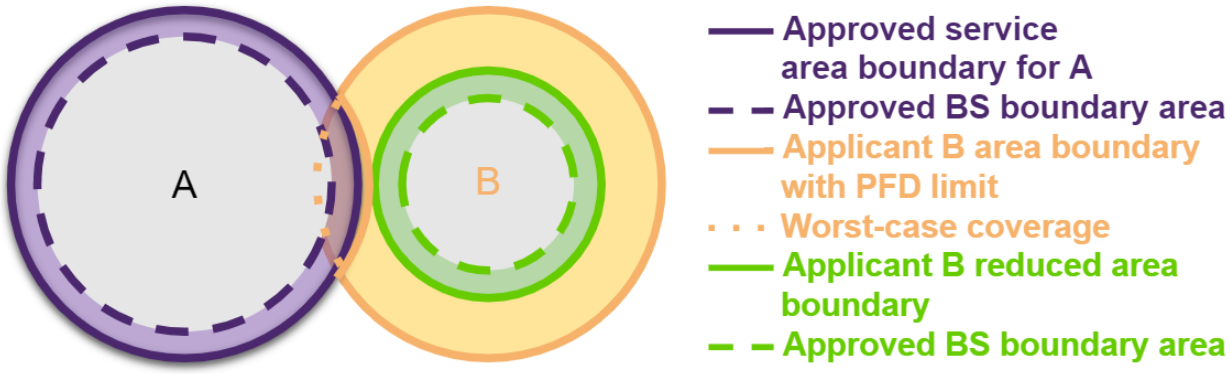
An explicit PFD parameter may not be necessary for an initial automated licensing process of low-power systems that would have little coverage beyond the licensed service area and hence interference with a neighbouring licensee. However, once the applicant supplies minimal site information shortly after license grant, the system can run the coexistence analysis based on worse-case scenario parameters, coupled with the applicant's site data, consistent with the standard PFD boundary limit (based on -6 dB I/N). This process is further described in RABC's response to question 19, below. Developing an additional licensing option based upon an explicit PFD for medium to high power systems to enable large coverage areas would increase spectrum licensing opportunities over licensing these same systems without a PFD due to the nature of worst-case modelling inherent in NCL licensing (i.e. large buffer areas calculated from an automated system).

A primary use case for PFD licensing is illustrated below[1] for a low-power licensee (A) with an approved coverage contour ('purple' circle) and applicant B's high-power level requirement. Applicant B's power classification predetermines a PFD limit at the licensed area boundary ('orange' circle) with the requirement to ensure coexistence through its site design submission (i.e. prior to operations).



Another use case for PFD-based licensing is illustrated below for the initial low-power NCL licensee (A), with a potential application denial for Applicant B due to the potential interference as marked by the overlapping service area of licensee A ('purple' circle) with the 'orange' dotted line of Applicant B.

[1] The circles below are used only for ease of representation and are not suggesting the use of radius-based model.



A supplementary licensing option would offer a PFD restriction to the area boundary of Applicant B to enable coexistence, albeit with additional engineering required by Applicant B in its placement of radio infrastructure in service area to meet a PFD limit defined in the associated SRSP. In the example above, Applicant B could reduce its licence to the 'green' licence area to remain within the simple NCL licensing process. The supplementary licensing option using a PFD limit would be compatible with the simple NCL licensing process that inherently prescribes an implicit PFD limit. Following the same approach, the next applicant (e.g. Applicant C) would be assessed using the composite the service areas (based upon the PFD) of licensees A and B.

Alternatively, Applicant B could reduce its licence to the 'green' licence area to remain within the simple NCL licensing process.

Response to Question 7:
ISED is seeking comments on potential approaches to reduce the administrative burden on applicants and facilitate partial automation of the licensing process.

To achieve ISED's stated goal, RABC recommends an approach that would implement the coexistence analysis for NCL licenses using an automated process based on a set of baseline technical parameters for each frequency band and geography. If the NCL applicant's proposed license parameters fail coexistence requirements utilizing the automated process, ISED could then implement a supplemental step whereby it could still grant the NCL license if the applicant agrees to one or more mitigation measures. The approach is discussed in detail in RABC's response to Question 19 below.

Given that ISED is implementing a new automated system that will support many first-time licensees, there are minimal efficiencies that can be achieved from the administrative side. For instance, pre-populated data features would not be helpful until license renewal or modification (if applicable). However, upfront education is relevant for first-time applicants who do not have the resources to hire RF engineering expertise. For instance, before the first-ever incentive auction, the FCC held webinars on license characteristics and the licensing process for prospective applicants and published detailed instructions on how to submit auction applications.

Response to Question 14:
ISED seeks comments on establishing a condition of licence for NCL licences to provide site data information relating to the radiocommunication installations associated with the licence.

As noted in the consultation, ISED aims to implement a licensing approach that is "easy for users to access spectrum" and suggests using an automated licensing process. RABC suggests that any such process should only require applicants to enter all the appropriate information into the system once, i.e., applicants for new NCLs should not be burdened with a multiple-stage process requiring the entry of multiple types of technical information for the automated license process to effectively determine potential co- and adjacent channel interference scenarios. Also, an incumbent entity that has deployed an NCL system should not be burdened with (a) the need to constantly monitor for sources of interference from new adjacent NCL systems or (b) mitigating interference from new adjacent NCL systems, to include entering additional information into the automated licensing system after a new adjacent system has been deployed. Additionally, while ISED has proposed low power levels for urban areas, RABC has concerns that low power levels may impede the successful deployment of viable use cases in 3.9 GHz and mmWave bands, and it is too soon to tell whether non-low-power-level applications will be the minority of the NCL application pool. Considering these concerns and in recognition that non-traditional licensees may lack RF engineering expertise (or may indeed have the expertise), we suggest the following two-step process, both of which will require technical data from the applicant--at different junctures of the licensing process—to conduct the automated coexistence analysis.

RABC recommends ISED consider its two-step process —as detailed in the RABC response to Question 19 below - to implement the coexistence analysis for NCL licenses using an automated process based on a baseline set of technical parameters, including the supplementary step with a PFD boundary limit with varying levels of EIRP restriction based on power levels, for each frequency band and geography. Site data will be required to run the coexistence analysis, although the extent to which additional data must be provided depends on whether the applicant's proposed operating power level fails to meet coexistence requirements.

Response to Question 16:
ISED is seeking comments on whether a distinction should be made between indoor and outdoor NCL licensing and the type of technical rules and interference mitigation measures that could be required; and if such mitigation measures should only be applicable to certain NCL licensing bands (e.g. higher frequency bands with relatively poor ability to penetrate walls given their propagation characteristics) or only to bands not shared with other radiocommunication services.

RABC cannot comment at this time on whether a distinction between indoor and outdoor systems is necessary. Unlike the 6 GHz band which is unlicensed, all NCL systems are licensed and are supposed to go through interference analysis before deployment.

One point that RABC does recommend though is that the RSS for NCL should include terminal equipment information for all supported types of devices: indoor and outdoor (should ISED choose to make a distinction between these two uses), fixed and mobile, with the reference to SRSP for other information such as base stations, PFD limit, etc. Having all the requirements in one place will make it easier for operators to understand what they can do under the NCL umbrella.

Response to Question 17:
ISED is seeking comments on the availability of equipment for NCL licences, especially if differentiation is needed on the type of equipment that would allow for the co-existence of indoor (e.g. no weatherized enclosure, no battery power) and outdoor NCL licensing applications in the same spectrum frequency bands in the same area.

NCL licensing in the 3900 MHz, as well as 26, 28 & 38 GHz bands is supported by the Third Generation Partnership Project (3GPP) band n77 (3300-4200 MHz) and the bands n258 (24.25-27.5 GHz), n257 (26.5GHz-29.5 GHz), n261 (27.5-28.35 GHz) and n260 (37-40 GHz) for mobile wireless services. It should be noted that the 3900 MHz band in Canada overlaps with the licensed 3700-3980 MHz band in the United States (U.S.), while the mmWave bands are the same as in global markets.

The equipment used in those bands will have to comply with the ISED Radio Standards Specification (RSS). The RABC recommendation for those bands is to enable a global equipment ecosystem and avoid imposing Canadian-specific equipment requirements that risk fragmenting these ecosystems. Such an approach will enable NCL licences to support a broad range of connectivity use cases. Therefore, RABC proposes that ISED follows a band plan and RSS that broadly aligns with the band n77 ecosystem made available for the U.S. markets and global mmWave ecosystems without NCL incremental specificities to be implemented in the equipment.

A phased allocation of spectrum would force Canadian operators to implement a specific mechanism to differentiate devices certified in the first place, compliant with the initially allocated frequency range, from future devices that will require different certification to comply with additional spectrum that ISED may allocate. This concern would require Canada to have a specific user equipment ecosystem that considers new Canadian signalling functionalities to be implemented in the 3GPP standard to differentiate those phases of device introduction.

Such concern can be avoided with a forward-looking approach that RABC strongly recommends:

1. Update RSS192 to include the entire 3450-3980 band, which would cover the previously auctioned 3500 MHz band (3450-3650), the future 3800 MHz band and the Non-Competitive Local Licensing (3900-3980),

2. Developing a single RSS for the 38 GHz band to cover the entire 3GPP band n260 (37.0 – 40.0 GHz), and
3. Developing a single RSS for the 26&28 GHz band to cover the entire 24.25-29.5 GHz band.

It is important to highlight that the recommended forward-looking approach does not imply any risk of operation of certified devices in a non-allocated portion of the spectrum as the control of the band allocation for the UE is handled by the base station.

Response to Question 18:
ISED is seeking comments on general interference mitigation measures that could be implemented to enable band sharing between indoor and outdoor NCL operations, as well as other radiocommunication services, if indoor and outdoor NCL licenses are issued to different operators.
In providing comments, respondents are asked to include supporting rationale and arguments.

RABC is highlighting that network synchronization is critical for TDD networks to facilitate the usage of shared spectrum both in outdoor and indoor operations. Operation of unsynchronized TDD systems would require enhanced isolation across operators (NCL licensees and spectrum licensees in adjacent spectrum) to reduce the risk of interferences. Isolation across unsynchronized TDD systems can be achieved through the restriction of usage of spectrum blocks (e.g., restricted blocks, guard bands), additional filtering on the equipment's operating in the band or by stringent site coordination among network operators for efficient usage of the spectrum.

Network synchronization across different operators can be managed at the national level through a voluntary agreement between operators or national regulatory measures. In the case of NCL licensing, it is expected that the NCL spectrum will be used by a large number of operators, including inexperienced radio systems operators, and therefore it will be difficult to ensure that these radio systems operators consider the benefit of a common TDD frame structure in reducing interference (i.e. engineering to meet a -6 dB I/N protection criterion). As a result, RABC recommends ISED to enforce common synchronization of TDD for applicants of the automated licensing process but allows licensees to elect for a non-standard TDD synchronization format and accept the technical limits associated with the -6 dB I/N protection criterion for in-band and adjacent band services whether for outdoor or indoor operations if radio system operators are of the opinion that TDD synchronization would not be worth the added complexity on network design and equipment availability.

Synchronized operation mainly requires NCL licensees to operate with a common reference phase clock (e.g., for the start of frame) and common or compatible frame structures (e.g. length of frame, TDD ratio, etc.) in order to align uplink/downlink switching points. This is

straightforward in the case of the same technology, but it needs careful analysis in the case of cross-technology synchronization.

ECC report 216[2] provided recommendations about TDD systems synchronization across a variety of technologies.

GSMA document "5G TDD Synchronization Guidelines and Recommendations for the Coexistence of TDD Networks in the 3.5 GHz Range"[3] provides recommendations on how the mobile industry should address possible interference issues among networks.

Response to Question 19:
ISED is seeking comments on its proposal to manage access to the NCL bands and to conduct coexistence analyses through an automated licensing process for NCL operations.

RABC understands ISED intends to implement a simple NCL licensing process that may require little to no technical site information for NCL applicants and hence automated coexistence analysis would use the worst-case modeling and equipment technical specifications. As noted previously, RABC has concerns that a limitation of low-power-level operations for urban areas may impede the successful deployment of viable use cases in 3.9 GHz and mmWave bands, and it is too soon to tell whether non-low-power-level applications will be the minority of the NCL application pool.

RABC therefore recommends ISED adopt a centralized automated licensing process where each radio is permitted to operate at the maximum permissible power in each frequency band and geography but where the standard equipment power associated with the licence would be sufficiently low that an automated system can ensure coexistence without any technical design information during the application process. This approach provides two-options for applicants, premised on the notion that some applicants will not have the RF engineering expertise to submit technical data during the license application phase. Both options would require technical data from the applicant—at different junctures of the licensing process—to conduct the automated coexistence analysis.

Option 1: This option is likely for applicants with little to no RF engineering expertise requiring low-power operations. The applicant can provide the coordinates of the licence area and make an attestation that it will:

(a) design its network in compliance with ISED's baseline technical parameters before initiating operations, and

[2] https://docdb.cept.org/document/323

[3] https://www.gsma.com/spectrum/wp-content/uploads/2020/04/3.5-GHz-5G-TDD-Synchronisation.pdf

(b) within 60 days from the licence being issued, upload the site data (e.g., location of sites, channel center frequency and bandwidth, antenna heights, gains, pointing angles, beamwidths, utilized EIRP levels, etc.) into the automated system.

Thereafter the applicant may receive confirmation from the automated system that no coexistence issues exist, along with the 'specified base station deployment area(s)' based upon an implicit PFD boundary limit. If the applicant fails the coexistence analysis, it will need to consider the supplemental step if it still desires the NCL license.

If, after the licence is issued, the licensee wishes to make substantive changes to its network design (e.g., operate at a different power level) that may render the licensee non-compliant with the relevant baseline technical parameters for low-power operations, it must immediately notify ISED, and follow the supplemental step below. ISED may need to resolve whether or to what extent a "substantive" change will impact the applicant's place in queue for purposes of the FCFS scheme and relative interference protection from co- and adjacent channel operators because, as a general matter, it would be impractical to expect co-channel and adjacent operators to accommodate an applicant who makes substantive network changes that violates the license grant without mutual agreement.

Option 2: If the applicant requires medium to high power operations and it has the RF engineering expertise available at the time it submits the NCL license application (or is otherwise prepared to accept a PFD limit and provide the relevant technical specifications for the automated system to run the coexistence analysis), it can submit the relevant site data and other technical specifications with its license application, at which point the automated system can run the coexistence analysis. After running the analysis, if the automated system determines that there are no coexistence issues that need to be addressed, ISED may issue the requested license.

Supplemental step: Regardless of whether the applicant selects Option 1 or 2, if the automated system determines that the applicant has failed to meet the relevant coexistence requirements, ISED may nonetheless issue the NCL license to the applicant if, after submitting any needed additional information (e.g., OOBE mask[4]), the applicant agrees to implement one or more of the following measures, depending on the technical issues that triggered the coexistence failure:

(1) agree to a more restrictive PFD boundary limit,
(2) agree to a more restrictive base station EIRP,
(3) reduce or modify the proposed license area, and/or
(4) enter into a cooperative agreement with the potentially impacted licensees who have been afforded interference protection from NCL operations by ISED.

Alternatively, the applicant could accept a smaller service area as computed by the system in the supplementary step.

[4] RABC assumes ISED will adopt an OOBE mask that has been specified by standards bodies (e.g., 3GPP).

By adopting a centralized automated model, ISED will only need to architect one set of technical requirements for each frequency band and geography (e.g., 3.9 GHz indoor/outdoor in urban areas, mmWave indoor/outdoor in urban areas, and operations in rural and unserved areas). Licensing coexistence requirements could follow the best engineering practices by band with simplified inputs for NCL licensing. For example, the FCC typically uses a centralized model over a distributed model, where the former is demonstrated by use of databases to manage authorizations for devices operating in 6 GHz, TV White Spaces, or CBRS (3.5 GHz).

Applying one set of technical standards per frequency band and geography for the automated portion of the process streamlines and simplifies the licensing process for applicants with few coexistence issues. For example, low-power 3900 MHz equipment in urban areas may have a relatively short coverage radius beyond the licence service area for outdoor operations. Low-power mmWave equipment in urban areas would likewise have a short coverage radius beyond the licence service area for outdoor operations. When ISED subsequently seeks comment on technical specifications associated with the NCL licensing, RABC plans to propose power levels and radiuses that could be the basis for computing 'specified base station deployment area(s)' for automated licensing.

However, in scenarios where high- or medium-power level equipment is required by the applicant (e.g., rural and unserved areas), RABC's proposes a minimum PFD limit for licences of high or medium power classes. A supplemental step may be helpful for applicants seeking more licensing flexibility or for applicants that fail to meet coexistence requirements as determined by the automated system. These high- or mid-power level licensees would have the option to accept a more restrictive condition of licence as offered by the supplementary step.

In summary, RABC recommends that an automated licensing process initially support low power systems as standard (and with a common TDD synchronization format) with no initial technical information required on application; rather, technical information would be provided after licence grant, when the applicant has finalized network design, so the system can then run the coexistence analysis. RABC recommends a second option that would grant high- and medium-power licences and a supplementary step that may apply more restrictive conditions of licence as required for coexistence in the NCL bands, as well as coexistence with services in adjacent bands.

Response to Question 20:
ISED is seeking comments on whether there is a need to provide additional feedback (e.g. possible modifications to submitted technical parameters that could enable access to the band) on applications that are rejected due to interference concerns as part of the licensing process.

Yes, ISED should offer details about why an application was rejected by default. ISED should offer possible modifications upon request. The department is opening NCL to bring in new

spectrum users. These new spectrum users may require additional assistance to deploy compliant systems. As such ISED should endeavour to highlight how applications can be improved.

Response to Question 21:
ISED is seeking comments on its proposal not to mandate specific technology solutions (e.g. TDD synchronization between systems) to address interference issues, but to instead set technical rules to facilitate coexistence.

In providing comments, respondents are asked to include supporting rationale and arguments.

The RABC is not aware of any technical reason NCL could not be used with a suite of different technologies, however, 5G licensed technology will likely be the predominant technology. As such the RABC supports ISED's technology agnostic position. That being said, as indicated by RABC in response to question 18 above, mechanisms to optimize the use of spectrum such as TDD synchronization when two applicants are using TDD should be encouraged.

Response to Question 31:
ISED is seeking comments on any issues that the NCL licensing framework may raise regarding numbering resources (e.g. Mobile Network Codes) and whether the US approach or the non-routable MCC 999 may be sufficient for operating private networks under the NCL licensing framework in Canada.

Mobile Network Codes (MNCs) are a finite resource that are only available to operators according to the "Canadian International Mobile Subscription Identity ("IMSI") Assignment Guideline". Adding additional eligibility rules to the Guideline would take a significant time and may lead to a shortage of MNCs.

It would be preferrable to adopt ITU approach of using the non-routable MCC 999 for the operation of private networks under the NCL licensing framework. This would reduce the administrative burden on the Canadian Number Administration since they would no longer be required for the assignment of MNCs for these networks. This would also allow for operators that presently do not have the eligibility to apply for a MNC to implement a network.

In a licensing area, it would be beneficial to have some way of ensuring that operators do not use the same MNC for their private networks. This could be automated as part of the licensing application process.

It is noted that the US assigned an entire MCC/MNC (315/010) for CBRS services in the 3500 MHz. However, Canada does not have access to an additional MCC that could be reserved for such an assignment.

Response to Question 32:
ISED is seeking comments on any other issues related to routing calls or that would be required for proper operation of mobile equipment within a private network or for a private network to communicate with a public network that need to be considered for the implementation of the NCL licensing framework. In providing comments, respondents are asked to include supporting rationale and arguments.

By nature, a private network is not intended to route calls to the public network. However, there are strategies to allow for devices to operate in both environments.

Many modern devices can make use of dual SIM cards allowing access to the public network as well as to the private network. This allows the user to place calls on either network depending upon their connection. Private Branch Exchanges (Pbx) can be configured for ringing multiple numbers allowing for both networks to receive the call so that the user can be reached no matter which network they are connected to at the time. In this case, the user would have 2 different numbers.

Alternatively, the licensee could use VoIP and use Wi-Fi calling to create a secure tunnel to the Public Network while on the private network and switch to the second SIM card while connected to the Public cellular network. In this case, the user would have only one telephone number provided by the cellular provider.

For data devices, typically they will be assigned private IP addresses that could be addressable via the public network using Network Address Translation (NAT). These devices will be protected from the public network (Internet) via a firewall (not necessary for voice, but VoIP).

Response to Question 33:
ISED is seeking comments on the equipment ecosystem for NCL licensing in the 3900 MHz band.

NCL licensing in the 3900 MHz band is supported by the Third Generation Partnership Project (3GPP) band n77 (3300-4200 MHz) for mobile wireless services. The 3900 MHz band in Canada overlaps with the licensed 3700-3980 MHz band auctioned in the U.S. in February 2021. In the U.S., the specific 3900-3980 MHz band is intended to be cleared on an accelerated timeline by December 2023 and certainty by December 2025. Like in Canada, the U.S. created a 20 MHz guard band in 3980-4000 MHz. Therefore, equipment ecosystem for the 3900 MHz band in Canada is expected to be readily available.

Several equipment manufacturers provide non-3GPP-standard equipment for use in the US CRBS band (3550-3700 MHz). This equipment typically supports TDD frame synchronization

with 5G-standard equipment. Some of these equipment manufacturers may extend their frequency range operation up to 3980 MHz for use in the 3900 MHz NCL band.

Response to Question 39:
ISED is seeking comments on its proposal that adjacent band coexistence between potential NCL operations in the 3900 MHz band and flexible use operations in the 3800 MHz band be determined through an automated process.

It is necessary to ensure protection of adjacent channel operations for incumbent services. For example, the FCC decided to utilize an out-of-band emission mask for 6 GHz unlicensed devices, designed to keep energy outside an unlicensed device's operating channel to low levels based on -6 dB I/N protection criterion.

To protect FSS earth stations in 4000-4200 MHz, the FCC adopted a PFD of -124 dBWm^2/MHz based upon a -6 dB I/N protection criterion

Considering that flexible use licensees below 3900 MHz and NCL 3900 MHz licensees will most probably use the same predominant technology (3GPP TDD-based), then an optimal coexistence should also take advantage of TDD synchronization

ISED should broadly align adjacent-band coexistence requirements with those applied to the adjacent commercial bands. Reciprocal requirements would provide protection to both NCL operators and commercial operators in the 3800 MHz band and provide consistent rules for operators in both bands.

Response to Question 40:
ISED is seeking comments on its proposal to align in principle with the mitigation measures described in SRSP-520, Technical Requirements for Fixed and/or Mobile Systems, Including Flexible Use Broadband Systems, in the Band 3450-3650 MHz to protect radio altimeters from flexible use operations but adapted to the proposed lower power NCL licensing in the 3900 MHz band, which would be incorporated in an SRSP.
In providing comments, respondents are asked to include supporting rationale and arguments.

RABC understands from the updates provided by the Department to the RABC 5G/Radio Altimeter Coexistence Working Group, that the Department is continuing to analyze the data it obtained from studying the interference issue. We understand further that the Department may develop new technical rules. The Board will provide additional comment in response to any additional consultations on this matter.

Response to Question 42:
ISED is seeking comments on the equipment ecosystem for NCL licensing in the mmWave band.

RABC recently provided information on ecosystem for bands in 26, 28 and 38 GHz as part of the *Consultation on a Policy and Licensing Framework for Spectrum in the 26, 28 and 38 GHz Bands,* (SPB-001-22).[5] In SPB-001-22, ISED proposed to reserve 200 MHz in the 26 GHz band (26.5-26.7 GHz), 50 MHz in the 28 GHz band (28.3-28.35 GHz), and 800 MHz in the 38 GHz band (37.6-38.4 GHz) for a future non-competitive licensing process. Those bands are supported by the Third Generation Partnership Project (3GPP) bands n258 (24.25-27.5GHz), n257 (26.5GHz-29.5GHz), n261 (27.5-28.35GHz) and n260(37-40GHz). There is mmWave equipment in the market globally today that supports each of these 3GPP bands, including base stations, customer premises equipment and mobile devices.

Response to Question 43.
ISED is seeking comments on the type of uses envisioned for the mmWave bands that are proposed for NCL licensing.

mmWave enables wide radio carriers with shorter transmission time intervals and lower radio-interface latency to facilitate the introduction and support for low-latency-sensitive applications. A myriad of 5G use cases for private and enterprise networks can be supported, such as:

- Surveillance and video streaming
- Augmented Reality/Virtual Reality
- Smart factories (Industrial control, Automated Guided Vehicles, smart robots, manufacturing)
- Warehousing
- Drones (lower bands for control and mmWave bands for traffic)

mmWave technology enables a very reliable and responsive connection that is suitable to replace cables in production environments. Enterprise customers in port operation, factories, warehousing, and distribution centers will benefit from robots with embedded wireless connectivity that makes them easy to integrate in a seamless and reliable manner.

Response to Question 45b:
Would a spectrum aggregation limit (cap) of 200 MHz in a given Tier 5 service area be an appropriate level?

[5] RABC Response to Question: https://www.rabc-cccr.ca/spb-001-22-consultation-on-a-policy-and-licensing-framework-for-spectrum-in-the-26-28-and-38-ghz-bands/

Below are data rate requirements for some use cases for enterprise and private networks. The total capacity requirement may vary based on number of devices and use cases being served in each area. Enterprise use cases at times tends to be more uplink driven, requiring higher capacity. For example, use cases such as high number of Automated Guide Vehicles (AGV's), Automated Mobile Robots (AMR's) on the floor in addition to other connected devices. Amount of spectrum aggregation limits will dictate possible use cases.

Use Cases	Data Rates
XR (AR/VR)	2 - 100 Mbps
Industrial Sensors	< 2 Mbps
Video Surveillance	2 - 25 Mbps (based on video quality)

**********end of document**********