



CEA Response to Progress Report on a National Public Safety Broadband Network (PSBN)

August 9th, 2019

About the Canadian Electricity Association (CEA)

1. CEA is the National Voice of Electricity. 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 that keep the industry running smoothly. Canada's electrical grid is 82% non-GHG emitting and getting cleaner every year. CEA, and its members promote electricity as a key economic, environmental and social enabler that is essential to Canadian prosperity and the Clean Energy Future.
2. CEA members, Canadian electric utilities (CEUs), need telecommunications networks to: 1) maintain secure and dependable tele-protection systems, 2) monitor and control electric infrastructure, and 3) enable the safe and efficient dispatch of their field workforce for routine and recovery operations.
3. Utilities typically make use of both commercial services and private networks. This combination often provides the best overall cost, performance, resiliency, and coverage. CEA members operate infrastructure across Canada in the largest cities and, due to remote electrification mandates and distant generation assets, in the most remote populated regions. Thus, they require a range of telecommunications options that can meet the challenges imposed by this diverse geography.
4. Through this document CEA identifies how PSBN can be structured to support CEU inclusion. CEU inclusion in PSBN is important to Canada because it will help deliver the [Smart Grid](#)¹. The Smart Grid is necessary for Canada's electrification goals as it will better allow Canadians to integrate new technologies, like electric vehicles. The benefit to Public Safety is that by partnering with CEUs the challenges of delivering PSBN coverage to rural and remote communities as well as the overall sustainability of the system can be improved.

¹ <https://electricity.ca/wp-content/uploads/2017/05/SmartGridpaperEN.pdf>



Summary of CEA Recommendations

6. CEUs are generally interested in adding PSBN to electricity sector's toolbox. However, CEUs will only do that if PSBN considers CEU specific needs and allocate space for those needs. To help make space for CEUs, CEA recommends that:
 - Service Delivery Model D be used as this model best allows for provincial governance which aligns with public safety funding and governance structures.
 - Multiple primary licenses be issued at a regional level, as this will support region specific needs, as well as increase both coverage and service provider competition.
 - Network message traffic engineering policy and standards must be established, and these need to take into account certain electric grid protection, automation, and control signals, critical to the safe and reliable operation of the electric grid. CEUs due to their contribution to emergency response electric system safety should receive very high prioritization within PSBN.
 - The Temporary National Coordination Office (TNCO) should support Private Virtual Network Operator (PVNO) to help CEUs partner with PSBN for coverage expansion, interoperability, as well as incentivize rural and remote telecommunications business growth for additional coverage expansion.
 - In addition to FirstNet, the PSMB (a.k.a. PSBN) model of New South Wales Australia should be used as a PSBN model to take inspiration from because it incorporates a PVNO like model.
7. CEA recommends that the TNCO should investigate whether the PSBN national entity operating an at cost Internetwork Packet Exchange (IPX) with regulated connection fees will support PSBN affordability & sustainability.
8. Additionally, because CEA sees PSBN as a key component of NG9-1-1, the requirements for public safety communications supported by existing mobile service providers should evolve as well. The PSBN PLMID should be broadcast on all other LTE bands so that PSBN members have immediate access to an expanded coverage network instead of having to wait for the system to built one piece at a time.
9. Making PSBN service an all-band requirement akin to mandatory 9-1-1 service to the public would incent existing mobile or new service providers to participate in PSBN deployment by attracting PSBN users and traffic. This will promote mobile network operator (MNO) provider deployment of band 14. But all MNO whether they deploy band 14 or not will have the opportunity and an obligation to serve PSBN.



CEUs & PSBN – Partners, Members

10. On June 28th the Temporary National Coordination Office (TNCO) released its first report on the forthcoming Public Safety Broadband Network (PSBN) the “Progress Report on a National Public Safety Broadband Network” (the report). CEA is pleased to provide our generally positive response to that report and its proposals.

11. In this, our response to that report we cover the following topics.

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12. CEA and the TNCO are seeking a similar objective; a network of networks to improve the reliability, resiliency, and security of telecommunications for critical parts of Canada that are underserved by the existing telecommunications market. The TNCO is working to achieve these goals through PSBN and CEA through both our Private Virtual Network Operator (PVNO) advocacy as well as making the case for our formal inclusion in PSBN.

13. CEA is advocating for both PVNO and PSBN because while PSBN is a good tool, it is PVNO that will allow CEUs to use all available options to craft the most economically efficient telecommunications network for operating the Smart Grid. PSBN is only a piece of that network because CEA and TNCO’s goals are slightly different because of different needs and spectrum opportunities. PSBN is designed foremost for first responders, which makes sense, and CEUs have a role to play there. But if CEUs are to deliver the Smart Grid they will need a great deal of control in the configuration and development of network attributes to optimize for CEU Smart Grid use. That level of control can only be found in an economically efficient way with a PVNO approach which is able to leverage all available options.

14. That said CEA sees strong alignment with TNCO and is generally excited at the prospect of being able to add PSBN to our industries’ telecommunication toolbox. Two specific applications of PSBN are of most interest to CEA members

- a) The robustness of dedicated and deployable PSBN systems where the core components are local to the base stations and towers. In this environment even if a remote Critical Infrastructure facility (e.g. a dam) is isolated from other networks due to backhaul



failure, local personnel, and warning systems, both CEU and non-CEU (e.g. first responders), can remain operational and with carefully applied SOP interoperable.

- b) Owing to the RF characteristics of band 14, PSBN can offer increased connectivity to ground level, underground, and indoor field assets. CEUs have traditionally used their own purpose built field area network (FAN) to reach field assets but as smart grid components including sensors and switches are increasingly moved into the residential, indoor and underground areas there is a need to improve connectivity. The challenge is that it is not economically efficient for CEUs to increase their networks to reach ground level equipment because that would require building a dedicated FAN comparable to existing cell carriers (the carriers have similar coverage and device connectivity needs). It can make financial sense for CEUs to partner with an agency like PSBN who is building their network out to “on the hip” coverage. With this partnership utilities offer cost offset to Public Safety agencies while having ground level etc. coverage that the CEU needs.

15. CEA sees our members potential participation in PSBN in two ways.

- a) In remote parts of Canada, CEUs could improve coverage by deploying PSBN compatible base stations for use by both CEUs and other emergency responders, this makes CEUs PSBN partners (a.k.a. providers or operators).
- b) And, throughout Canada CEUs could move mission critical data, and non-mission critical data across the PSBN to improve public safety and speed the recovery of the grid following an electrical outage, making CEUs PSBN members (a.k.a. users).

16. The caveat for these relationships (partner, and member [operator and user]) is that the business case must be there for CEUs to choose PSBN on its merits; choose to deploy band 14 compatible equipment in the field, choose to transmit data for a competitive cost to service ratio, and choose to trust PSBN with mission critical data.

17. This caveat should not come as a surprise to the TNCO and we do not feel it is a contentious position because affordability and sustainability are two of your key PSBN considerations. All our feedback is thus designed to address how the PSBN can be structured so that CEUs would want to chose PSBN and a significant lynch pin for that choice is for CEA members to have access to PVNO to best enable choices.

Service Delivery Model Selection

18. In general CEA agrees with the report’s conclusion that service delivery model D will be a good system for most of the goals of the PSBN.

19. For model D we caution the TNCO from being overly prescriptive in the regulation of the PSBN. Our professional opinion is that you should defer as much responsibility as possible from the



National PSBN Entity (a.k.a. national function body) to provincial authorities. The provinces are the ones on the ground who oversee and fund their own tri-services, as well as regulate their electrical utilities (electrical utilities who are important members of the emergency response community). Furthermore, municipalities/counties make even more granular funding decisions based on local needs and municipalities/counties are themselves provincial bodies. In other words, most public safety decisions and funding happen at the provincial and municipal/county level (sub-national), PSBN governance should be structured to serve that reality.

20. As part of this recommendation we iterate here from our 2018 submission to your office which gives high level description of the responsibilities at each governmental level for PSBN participants.
 - a) National entity: Overall coordination and strategic planning.
 - b) Regional entity: Operational responsibility within its region including contracting and administering contracts.
 - c) National / regional governance: Governance between the layers requires more study; however, user committees should drive requirements.
 - d) PSBN license holders: The national entity on behalf of the regional entities.
21. The benefits of a national office are real, and CEA supports that vision. The benefits include the coordination of standards, including security, network access always and interoperability as well as ensuring a consistent user experience throughout Canada.
22. The benefits of provincial level decision making are also real, and they include most significantly the ability to best tailor PSBN to regional needs. For example, Nova Scotia's hurricane PSBN needs will probably be different than British Columbia's earthquake requirements.
23. If provincial authorities can meet PSBN standards they should be allowed to develop their systems as they chose to meet their specific needs. Examples of divergent but not necessarily antagonistic PSBN structures include BC (e-Comm) and Ontario (Halton Police Department) with both conducting provincial level PSBN tests, each with a noticeably different structure. The interoperability test between BC and Ontario, which is being spearheaded by CEA members, is a good initiative which will aid in interoperability between regions such as York, Peel and Halton in Ontario; a key concern for PSBN.
24. Should both tests be successful, and both systems interoperable with comparable QSS (and other considerations such as sustainability and affordability) then both should be valid solutions for PSBN.



Licensing Schemes

25. CEA members strongly support “multiple primary licenses at a regional level” because that licensing system explicitly gives flexibility and regional oversight of PSBN while recognizing the national entities role is the setting of standards². Multiple primary licenses best align with provincial governance and funding for public safety and electricity. PSBN should accommodate the reality that it is at the sub-national level that most public safety decisions are made.
26. Additionally, multiple primary licenses at the regional level are also far more likely to support coverage (multiple providers in different areas) and affordability (multiple providers with some overlapping geography leading to competitive pricing).

Emergency Response Contributions from Electrical Utilities

27. CEA members are disappointed that the report referred to CEUs as commercial utilities instead of critical infrastructure operators, emergency response community members etc. CEUs are responsible for the continuous delivery and restoration of power, an essential service. The loss of electricity in a city/region is a massive public safety issue including traffic lights, people stuck in elevators, hospitals/nursing homes that move to part power when on generator. First responders are required to direct traffic, assist with rescues or provide aid to infirm home base patients when power is out. There is a massive economic and social toll the longer it takes CEU's to restore power and using existing commercial cellular is not an ideal option because of reliability and security concerns, to reach ground level field assets during large scale power outages.
28. Using PSBN, and/or a PVNO would reduce the time for CEUs to restore electricity from hours/days to minutes/hours. The alternative is that during lengthy restoration time emergency services would be required to deal with aid calls when they could be working on other emergency response elements.
29. It is important to note that CEUs desire for PVNO is so that commercial cellular can be used as an effective solution for ground level field assets. PSBN is not the only solution for ground level connectivity and if both PVNO and PSBN are available the ability for CEUs to connect with field assets CEUs emergency response will be even stronger.

Suggested Data Pre-emption/Hierarchy

30. In general, CEU SCADA (supervisory control and data acquisition) systems are public safety priorities. These are the devices and sensors that allow a CEU to monitor and operate their portion of the electrical grid and they are characterized by a highest data priority and relatively

² The report notes “The regional-level licensees are accountable for the delivery of the PSBN in the region while adhering to national PSBN standards”



low data volumes. If CEUs are to participate as members of the PSBN community it will be necessary for some of our traffic to receive very high prioritization in the QSS.

31. Outage management is an example of data that will also need to receive very high priority. Outage management is made up of two parts. The sensors which use signals from smart meters to identify what customers, and therefore what circuits (powerlines) are not functioning properly as well as automatic reclosers that can turn power on and off remotely. Both parts working together allows CEUs to safely isolated faulted circuits.
32. Other traffic is lower priority but still important and therefore could temporarily be bumped on a PSBN network by tri-services etc. in a major crisis but would receive higher priority than commercial users. For example, during the Raptor's victory parade in Toronto commercial systems were overwhelmed by traffic³. If important devices, such as the emerging technology of virtual power plants⁴, were operating through those networks the governing CEU would not have been able to communicate/operate those devices and manage the grid. Or, another example is that as high voltage electric car chargers increase in prevalence the ability for CEUs to reliably shut them down during structural fires will be important to ensure safety for fire crews and other first responders.
33. A recommendation that CEA iterates is that telemetry, from any PSBN user, is transmitted using narrowband internet of things (NB-IoT) in band 14 guard bands. This telemetry data would not impact PSBN users.
34. CEA members have compiled the following data use table for the purpose of creating a data hierarchy for pre-emption within PSBN, table 1.

³ <https://mobilesyrup.com/2019/06/17/cell-networks-overload-raptors-parade/>

⁴ <https://electricity.ca/lead/centre-of-excellence/power-house/>



Table 1. CEU Data Traffic Type and Volume

Device Type	Device Function	Data Priority	Per device traffic bandwidth, volume, occurrence	Device Density per population / customer
Telecontrol and telemetry (SCADA) (recloser /breakers VoltVar, load measurement, Line Sensors, Transformer Monitors)	Day-to-Day operation	Non interruptible	BW: 100-300 Kbits/s continuous with 1 Mbps bursts needed to account for restoration schemes that are running inter-tripping protocols Occurrence: Continuous 24/7 non-stop	1 device / 1K pop evenly dispersed. Growth 3%/yr
Telecontrol and telemetry	Maintenance and firmware upgrade	Best effort	BW: 300 Kbits/s Occurrence: 2-4/yr Volume: 20-100 MB, All devices should be updated within 24 hours Could be delayed by a few days. Won't occur during major outages, storms or other similar events.	1 device / 1K pop evenly disperse Growth 3%/yr
Smart meters	Outage notification	Non-interruptible	BW: 5-10 kbits/s Volume: 1 KB typical / power outage event Occurrence: Low 1-2 Mbits of last 'Gasp alarms' / power outage messages. Collected in realtime.	1 device per household or commercial customer (street address)
Smart meters	Day-to-Day operation for billing	Low	BW: 5-10 kbits/s Volume: 100 KB/day Occurrence: Spread over burst every 2 hrs. Most of the volume can be collected during off-peak hours (ex: during the night) Could be delayed for 24 -48 hrs	1 device per household or commercial customer (street address) Growth same as population / commercial



Device Type	Device Function	Data Priority	Per device traffic bandwidth, volume, occurrence	Device Density per population / customer
			Added info for Access Point/Collector based AMI 6 – 12 Mbits per site. Total of 6 to 25 Mbytes per day.	
Smart meters	Maintenance and firmware upgrade	Best effort	BW: 100 Kbits/s Volume: 1-5 MB Occurrence: 1/yr All devices should be updated within 7 days. Could be delayed by a few days. Won't occur during major outages, storms or other similar events.	1 device per household or commercial customer (street address) Growth same as population / commercial
Utility trucks and vehicles	<i>Similar requirements as ambulance refer to 2017 PSBN Day-to-day BW requirements</i>			1 device / 1K pop Growth: Same as population / commercial
Utility crew and linemen	<i>Similar requirements as first responders refer to 2017 PSBN Day-to-day BW requirements</i>			2 persons / 1K pop Growth: Same as population / commercial

Coverage improvements

35. The direct partnership between CEUs and PSBN to improve coverage in parts of Canada that are deemed uneconomical for traditional telecommunication carriers is a great opportunity for both CEUs and the PSBN because CEU's infrastructure footprint far exceeds Canada's current wireless coverage, figure 1.

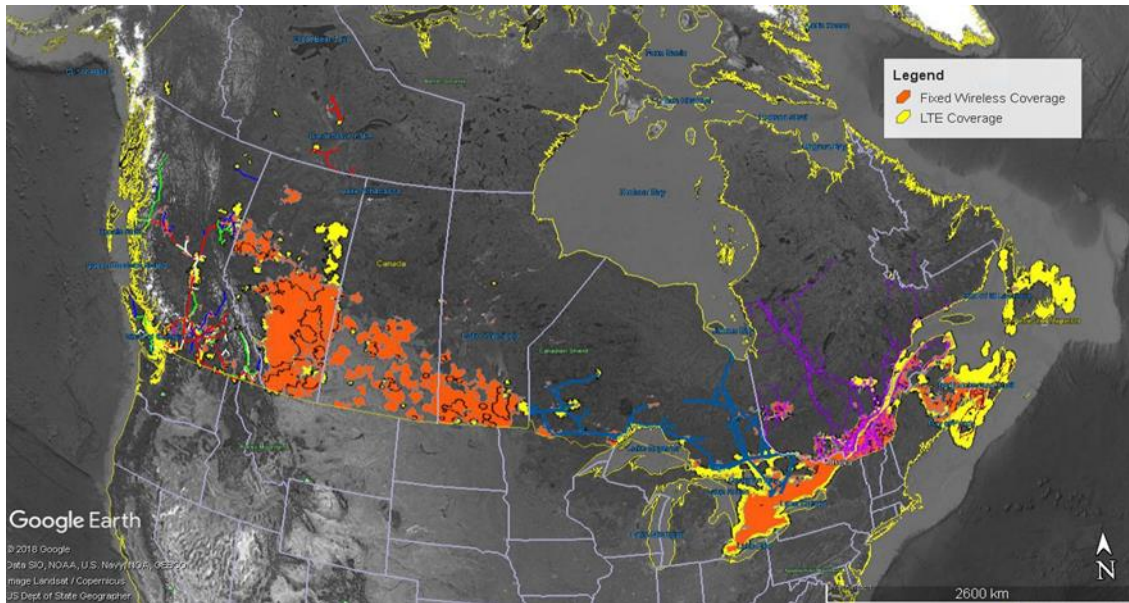


Figure 1. LTE and fixed wireless coverage of Canada compared to CEU generation and transmission assets, depicted as long linear features of various colours while the wireless coverage is depicted as fields of orange and yellow. Coverage data is taken from a 2014 CRTC database

Value of PVNO to PSBN

36. As already stated, the key to CEUs participating in PSBN as partners & members is the ability for CEUs to choose PSBN on its merits. It seems obvious to say but this choice is facilitated by CEUs being able to choose telecommunication providers on an ongoing basis instead of being locked into restrictive service contracts with a single provider. Which is why we are pleased that the report notes this same issue for PSBN as well as PSBN's need for dedicated cores, a shared network, interoperability between different carriers, and radio access network (RAN) diversity as these are CEU concerns as well.
37. To enable choice CEUs believe that the most sustainable system for themselves is a PVNO network architecture, figure 2. Our professional opinion is that PSBN would also benefit from a similar architecture because it will enable PSBN to interoperate between multiple RANs including CEU systems figure 3⁵. We recommend this because it will facilitate the broadcasting of the PSBN PLMNID across all bands such that any PSBN traffic will always go to the nearest operating station.

⁵ CEA understands that PSBN would be closer to a traditional Mobile Virtual Network Operator (MVNO) because the PLMNID is broadcast publicly but the roaming structure would be closer to how we envision PVNO.

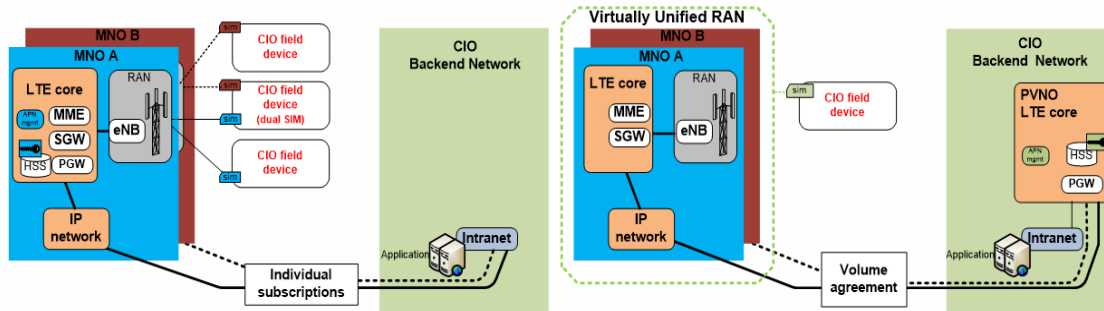


Figure 2. Comparing commercial cellular architecture (left) to a PVNO architecture (right) for critical infrastructure operators.

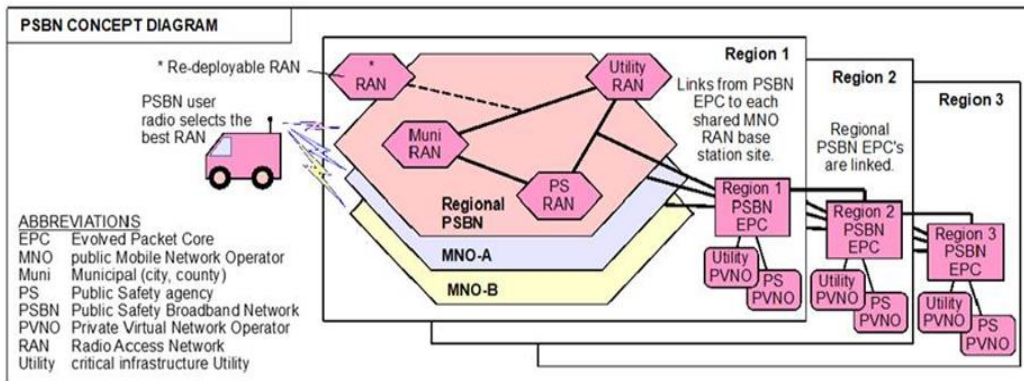


Figure 3. This figure was included in our first submission to the TNCO and we still hold that it is a good model on how to structure the PSBN.

38. The Australian PSMB (a.k.a. PSBN) model, which looks comparable to Canada’s PSBN needs, put out a [request for proposal in October 2018⁶](https://tenders.nsw.gov.au/dfs/?event=public.RFT.downloadSummary&rftuid=A0BFBF0-B999-6717-A0F1D3320BD7DBAF) for a new broadband delivery model that meets the following criteria

- A Mobile Virtual Network Operator (MVNO) model with multi-carrier roaming in metro and regional areas, which will benefit from the overlapping coverage and redundancy of multiple carrier networks and avoid the cost of hardening a single network.
- A Radio Access Network (RAN) sharing model would be used to address areas that require an expansion of existing coverage and would generally apply in rural and remote areas.

⁶ <https://tenders.nsw.gov.au/dfs/?event=public.RFT.downloadSummary&rftuid=A0BFBF0-B999-6717-A0F1D3320BD7DBAF>



- The potential use of deployable base stations in areas beyond the coverage footprints of conventional networks
39. The Australian requirements are a PVNO model, even if the term is not used. It also highlights how a CEU PVNO would be able to interoperate with the forthcoming PSBN. As such CEA believes the TNCO should look carefully at the network structure and governance model of the Australian PSBN/PVNO. We also acknowledge the challenges of their system where a sub-national government is trying to set national standards. In this regard we support TNCO's assertion that a national entity for standards setting is an important part of the Canadian PSBN.
40. Another way the PVNO principles supports PSBN, as well as Canadians in rural/remote parts of Canada is through the contract structure that a PVNO requires. Because a PVNO benefits from diverse RANs, the contracted volume agreements would be spread among multiple parties. This means that multiple carriers can have large anchor customers (i.e. CEUs), especially small carriers in rural and remote parts of Canada where Critical Infrastructure Operators (CIOs) such as Electricity and Rail operate.
41. PVNO is thus an enabler for the commercial wireless market because current contracts for commercial wireless service are winner take all or said another way, feast or famine. Going forward the contracts would be more stable because no longer would the market promote a commercial model where 1 bid winner gets the whole contract on a long-term basis. Instead the CEU could allocate traffic to the best service provider in any given area and, then allocate second and third place providers with progressively smaller chunks of the data traffic.
42. In this way, even if during contract re-negotiations, a carrier drops from 1st to 3rd place they retain a portion of the contract revenue. This spreading of contracts for telecommunications services will allow all carriers, large or small, to make investments with greater surety, especially in rural and remote parts of Canada. In this way the PVNO indirectly supports rural broadband programs by reducing some of the financial risk to carriers to provide services in remote areas.
43. Thus, there are two direct benefits for PSBN from a CEU PVNO. If there are carriers in the remote parts of Canada, because the new market allows them to develop stable businesses potential coverage is increased for the PSBN. And, if there are carriers in those remote parts of Canada there are customers for the PSBNs commercial use of unused spectrum.

CEA Suggestions to Optimize PSBN

44. CEA believes the Canadian PSBN should strive to ensure access to all available RAN to improve reliability through network diversity, while also avoiding single network commercial issues.
45. Internetwork Packet Exchange (IPX) is a well-established approach for interconnecting multiple networks and modern approaches enable policy and service level enforcement. How will IPX costs be avoided/mitigated? Will the National Entity manage the IPX service as well as



interconnections to other networks including FirstNet? IPX enables a neutral intermediary but this comes with a cost, minimizing these costs will make PSBN more affordable. CEA recommends that a the TNCO investigate whether the national PSBN entity operating an IPX at cost, and with regulated connection rates will support PSBN affordability and sustainability, and implement such a service if the investigation is positive.

46. The coverage and sustainability of PSBN could be improved if broadcasting the PSBN PLMNID on all bands, not just band 14, with the same pre-emption and priority of public safety user traffic. This is a logical evolution of 911 requirements to NG911. Public Safety user equipment would then connect to networks as they are available with preference going to
 - a) first on Band 14 deployed by the contracted MNOs with coverage expansion partnership,
 - b) second to contracted MNO's other bands that will also broadcast PSBN PLMNID;
 - c) lastly, connect to other present MNOs (on any band) in a mandatory wholesale roaming scenario.

47. This approach will be an incentive for a small MNO to participate in the PSBN on band 14 (access to band 14 frequency, public safety customer and commercial use of excess capacity). From a PS user perspective, it will result in the best coverage and resiliency possible. It is a way to rapidly make PSBN services available to a maximum of public safety users and an incentive for public safety users to opt-in. PSBN service will improve over time as the regional contracted MNOs will deploy band 14 and fulfill their expected site hardening obligations (ex: cell site backup power, etc.).



Conclusion

48. CEA thanks the TNCO for taking time to consider the view of its members on how to optimize PSBN for the most impact, best coverage and sustainability. For any follow-up questions please contact CEA's telecommunications lead, Alex Kent at either 613-355-4022 or kent@electricity.ca.

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FORTIS BC

