BEFORE THE CANADIAN RADIO-TELEVISION AND TELECOMMUNICATIONS COMMISSION

IN THE MATTER OF

AN APPLICATION BY CANADIAN ELECTRICITY ASSOCIATION (APPLICANT)

PURSUANT TO PART I OF THE *CANADIAN RADIO-TELEVISION AND TELECOMMUNICATIONS COMMISSION RULES OF PRACTICE AND PROCEDURE* AND SECTIONS 24, 25(1), 32, 35(1), 46.1, 46.2, 47, AND 55 OF THE *TELECOMMUNICATIONS ACT*

TO GRANT CANADIAN ELECTRICITY ASSOCIATION A SHARED MOBILE NETWORK CODE AND OTHER ASSOCIATED RELIEF

30 OCTOBER 2018

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Executive Summary

ES-1. As Canadian Electrical Utilities ("CEUs") increasingly rely on wireless communications for a myriad of services essential to the continued reliable function of Canadian electrical transmission and distribution grids, it is essential for the CEUs to be able to access public wireless communications networks in the most reliable and cost-effective manner possible.

ES-2. CEA is submitting this application ("Application") pursuant to Part 1 of the *Canadian Radio-Television and Telecommunications Commission Rules of Practice and Procedure* and sections 24, 25(1), 32, 35(1), 46.1, 46.2, 47, and 55 of the *Telecommunications Act*[1] ("the *Act*").

ES-3. CEA is requesting the following relief from the Commission:

a. An order from the Commission directing that the CRTC Interconnection Steering Committee (CISC) Canadian Steering Committee on Numbering ("CSCN") revise the Canadian International Mobile Subscriber Identity Guideline ("IMSI Guideline") such that CEA may be granted a two-digit Mobile Network Code ("MNC") to be shared amongst its CEU members;

b. The recognition by the Commission of a new type of Mobile Virtual Network Operator ("MVNO") namely a Private Mobile Virtual Network Operator ("PVNO"), which, while similar in most respects to a Full MVNO, would not offer telecommunications services to the general public, coupled with recognition that CEUs meet this definition.

ES-4. Canada's electrical grid has been identified by the federal government as constituting critical infrastructure. Electricity is necessary for the proper function of many other critical services, including, but not limited to, Health, Food, Finance, Water, Information and Communication Technology, Safety, Manufacturing, Government and Transportation. The failure of the electricity supply could result in loss of life, adverse economic effects, and a loss of public confidence in the integrity of Canada's electrical grid.

ES-5. Canada's electrical grid is also undergoing constant evolution to meet societal needs and take advantage of new technological developments. For example, electricity is increasingly being generated, stored, and distributed closer to end customers, partly as a result of the accelerating

[1] SC 1993, c 38 ["*Telecommunications Act*"].

adoption of renewable energy sources and new storage technologies. The electrical grid is also becoming increasingly digitized as CEUs and customers rely upon so-called "smart devices" to control, where, when, and how electricity is being used.

ES-6. In order to ensure the "always on" reliability required of Canada's electrical grid in the twenty-first century, CEUs are increasingly leveraging wireless communications in their operations. Some of the key ways in which wireless communications are being used include:

a. Real-time information sharing between field crews (typically for intra-utility, but also for inter-utility mutual aid including cross-border operations during emergencies);
b. Remote monitoring and control of crucial components of the distribution and transmission grids (including smart meters, fault detectors and substation management);
c. Remote monitoring of sensors in key elements of power generation (including seismic, slide, slope, flood, and other sensors);
d. Tracking of workers and assets for planning as well as optimization of incident response efforts;
e. Backup for fixed wireless microwave and wireline fibre optic telecommunications systems also used as described in items a through d.

ES-7. This new digitized electrical grid that leverages wireless communications is also known as the "smart grid". The smart grid allows CEUs to deliver energy more reliably, by deploying a smarter, more distributed grid. It also provides the tools for CEUs to create innovative new business models, such as enabling customers to optimize their use of electricity, as well as achieving operational and cost efficiencies, all while meeting demand securely and reliably.

ES-8. With emerging technologies and applications, the smart grid requires more and more devices integrated to the home. Without being exhaustive, according to CEA, a smart grid includes components such as smart meters, Intelligent Electronic Devices, plus two-way communications and power flow functionalities to:

- Quickly detect outages, so as to minimize the impact on the rest of system;
- Allow power to be distributed more efficiently and reliably (including peak load shaving);
- Integrate highly variable renewable energy sources, like wind and solar;

- Manage electricity generation flow from centralized power generating stations out to consumers, or from consumers and businesses back into the grid; and
- Facilitate the integration of electric vehicles.

ES-9. Smart grid technology is the necessary future of electricity generation, distribution, and transmission in Canada. Absent the deployment of smart technology, it will be very difficult for CEUs: (a) to ensure the 'always on' availability of electricity throughout the country that is so vital to the twenty-first century economy; and (b) integrate the renewable and user-generated energy sources necessary for Canada to meet its emissions reduction targets.

ES-10. Smart grid technology is also consumer friendly in that it better allows customers to control their electricity costs.

ES-11. There is a significant public safety element to the smart grid as disruptions in the electricity supply can put lives at risk. For example, the 2003 blackout in eastern Canada and the United States led to the deaths of at least 11 people. A subsequent review determined that smart technology would have largely prevented that blackout. A reliable electrical supply is also becoming increasingly important for protecting the sick and elderly who rely upon medical devices powered by electricity. Finally, smart grid technology enhances public safety by allowing the easier detection and thus deterrence of the increasingly common, but very dangerous, practice of electricity theft.

ES-12. Smart grid technology also enhances the safety of utility workers by allowing CEUs to better detect instances of 'islanding', where portions of the grid can remain electrified from local generators during blackouts despite appearing to not be electrified.

ES-13. A truly smart grid also greatly benefits the economy by reducing the frequency and duration of power outages that can result in billions of dollars of losses each year.

ES-14. For Canada's current electrical grid to evolve into a smart grid, CEUs need to be able to communicate effectively with the millions of smart devices that will be deployed into the smart grid. CEA conservatively estimates that within the next 10 to 15 years, CEUs will deploy more

than 25 million wireless data devices and over 50,000 voice devices to support the management of the electric supply.

ES-15. Realistically, given the vastness of Canada's electrical grid and the already significant overlap of the grid with the mobile wireless networks of Canada's Mobile Network Operators ("MNOs"), CEUs need to use these wireless networks in order to be able to communicate with the smart devices that they are deploying throughout the electrical grid. Given the immense costs of deploying mobile wireless networks, it simply is not feasible for even the largest CEUs to deploy their own ubiquitous mobile wireless networks. Indeed, many smart devices being used by CEUs today are built to contain SIM cards and are already connected to the mobile wireless networks of MNOs.

ES-16. Unfortunately, while leveraging mobile wireless networks is the best path forward for facilitating the development of the smart grid in Canada, CEUs are experiencing a number of problems under the current regulatory environment that are hampering the deployment of the smart grid in Canada.

ES-17. A significant problem is the phenomenon of SIM card lock-in. As noted above, a smart grid consists of tens of millions of smart devices deployed throughout Canada's electrical grid. Many of these smart devices rely upon SIM cards and mobile wireless connectivity to ensure two-way communications with the CEU and the smart device. However, these SIM cards are only programmed to connect to the mobile wireless network of the MNO that provided the SIM cards that is to say, they are locked into that network.

ES-18. This can be extremely problematic for CEUs. It effectively prevents CEUs from switching mobile wireless providers as switching would require truck rolls to each smart device, which could number in the hundreds of thousands or millions for large CEUs, to manually swap out SIM cards. The cost of these truck rolls is a serious competitive constraint that makes it prohibitively costly for CEUs to switch to a different MNO, even if a different MNO can provide better terms and conditions for providing mobile wireless connectivity to that CEU's smart devices.

ES-19. The high cost of switching and the resulting inability of CEUs to negotiate the best deals possible for providing mobile wireless connectivity for smart devices drives up the cost of deploying smart devices and slows down the development of the smart grid in Canada.

ES-20. SIM card lock-in also limits redundancy in the smart grid. Currently, smart devices subject to SIM card lock-in will not automatically switch communications to the mobile wireless network of an alternative MNO if the primary MNO's network ceases to function for any reason. When these outages in mobile wireless networks occur, CEUs are unable to communicate with their smart devices and effectively lose all visibility into the grid, thus preventing the proper functioning of the smart grid and immediately transforming a smart grid into a legacy grid.

ES-21. Aside from the competitive and redundancy issues associated with SIM card lock-in, CEUs have issues with extending mobile wireless network coverage in rural, and remote areas not served by MNOs in which the CEUs may have electrical infrastructure.

ES-22. In places where MNOs do not offer cellular coverage, CEUs could deploy their own private wireless networks. However, numbering resources are required to do so using 3GPP technology and CEUs must be able to interconnect with the existing networks of MNOs in order to ensure that CEUs can communicate with these smart devices located in rural and remote areas. The relief requested by CEA in this Application will enable this interconnection to occur.

ES-23. Furthermore, there are significant privacy and security concerns inherent in the development of the smart grid as each smart device is potentially a gateway for a cyber-attack by a malicious actor. Currently, CEUs do not have any control over key aspects of the security of their smart devices, including control of the SIM card credentials and subscription database, which are controlled by the MNOs providing mobile wireless connectivity to the smart device. This is unacceptable to CEUs and the relief requested in this Application will allow CEUs to apply utility-grade security standards to these potential vulnerabilities.

ES-24. In order to solve the problems noted above that are hindering the timely development of Canada's smart grid, CEA is proposing that CEUs be permitted to share a unique two-digit MNC

that will be administered by the CEA. With a unique two-digit MNC, CEUs will be able to provision their own SIM cards, implement the appropriate systems/networks under their own control, and negotiate corresponding parallel commercial agreements with MNOs.

ES-25. Having their own MNC will allow CEUs to let smart devices select the proper mobile network automatically and switch to another network when quality of service is inadequate or in case of major network failures. Crucially, if CEUs have their own MNC, this switching functionality will be able to be done remotely and will not require truck rolls to each and every one of the tens of millions of smart devices being deployed throughout Canada's electrical grid.

ES-26. Thus, at a stroke, the problem of SIM card lock-in will be solved, thereby addressing the competitive and redundancy shortcomings described above.

ES-27. Access to a unique two-digit MNC will also allow CEUs to interconnect their private wireless networks in rural and remote areas with the mobile wireless networks of MNOs, thus ensuring that CEUs have a path to communicate with these particular smart devices.

ES-28. With a unique two-digit MNC CEUs will be in a position to have their own core networks, which will be under their own control, thereby addressing the security concerns described above.

ES-29. In order for CEUs to be granted a shared two-digit MNC, regulatory change is required as the current ISMI Guideline, which governs the allocation of MNCs in Canada, does not envision the CEA being able to apply for a shared two-digit MNC for CEUs for the purpose of facilitating the deployment of the smart grid in Canada.

ES-30. CEA is thus proposing the following amendments to the IMSI Guideline, which would allow it to apply for a two-digit MNC to be shared amongst its CEU members:

a. Subsection 7.1 amended to add a new paragraph (d) that reads: "An Electric Utility related association, some of whose members operate as PVNOs, may also be an applicant for a two-digit MNC to be shared amongst its members who operate as PVNOs."

b. Subsection 7.3(a) amended to read: "The ability of a terminal to access telecommunication services from mobile wireless networks, regardless of whether the terminal itself is in motion or not, and the capability of the network to identify and locate that terminal."

c. Section 15.0, the Glossary, amended to add a new definition of PVNO as follows: "Private Virtual Network Operator (PVNO): is a full MVNO that only provides telecommunication services to itself and not to consumers, operates core network hardware (e.g., switches, routers) separate from all WSPs and has a service profile management system (e.g. Home Location Register [HLR], Home Authentication, Authorization, and Accounting [AAA], or Home Subscriber System [HSS]) for devices owned and/or operated by the PVNO that can access WSP networks in Canada."

ES-31. CEA is proposing that the Commission recognize a new category of wireless service provider, namely PVNOs. A PVNO would be the same, technically, as a full MVNO. However, it would not provide mobile wireless services to consumers, but only to itself (namely for private enterprise needs and internal telecommunication purposes). As such, there should be no requirements for PVNOs to adhere to any of the consumer-centric obligations imposed on MVNOs or wireless carriers such as wireless number portability. CEUs would be recognized as PVNOs.

ES-32. CEA notes that its proposal is not radical or unprecedented. The solution proposed by the CEA to facilitate the deployment of millions of SIM-card enabled smart devices throughout Canada's electrical grid has actually been implemented by the national telecommunications regulator in The Netherlands. Furthermore, both Belgium and Germany are also considering following the Dutch model and assigning MNCs to electrical utilities.

ES-33. The relief requested by CEA advances a number of policy objectives contained in section 7 of the *Act*, by buttressing the Canadian economy, enhancing competition, stimulating innovation, and protecting the privacy and security of customers of CEUs. The relief requested by the CEA is also consistent with the Policy Direction as by addressing the problem of SIM card lock-in, which effectively prevents competition in the provision of mobile wireless services to smart devices, it enhances reliance on market forces. The requested relief is efficient and proportionate

as it only requires minor changes to the IMSI Guideline and the recognition of PVNOs. The requested relief is competitively neutral.

1.0 Introduction and request for relief

1. Founded in 1891, the Canadian Electricity Association ("CEA") is the national forum and voice of the evolving electricity business in Canada. CEA contributes to the regional, national, and international success of its members. CEA is governed by a Board of Directors comprised of senior executives from its Corporate Utility Members. CEA's mission is to be the national voice for safe, secure, and sustainable electricity for all Canadians.

2. 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 the suppliers of materials, technology, and services that keep the industry running smoothly. CEA's strategic goal, on behalf of its membership, is to provide a comprehensive roadmap to address the industry's most pressing issues, including: infrastructure renewal, environmental protection, innovation and technology, Indigenous and North American partnerships, and regulation and security. CEA strives to deliver a coherent and convincing industry viewpoint to decisionmakers on critical policy and regulatory issues. CEA members involved in the generation, transmission, and distribution of electrical energy are collectively referred to as Canadian Electrical Utilities or "CEUs" in this Application.

3. CEA submits this application ("Application") pursuant to Part 1 of the *Canadian Radio-Television and Telecommunications Commission Rules of Practice and Procedure* ("Rules") and sections 24, 25(1), 32, 35(1), 46.1, 46.2, 47, and 55 of the *Act*.

4. As set out more fully below, CEA is requesting the following relief from the Commission:

   a. An order from the Commission directing that the CRTC Interconnection Steering Committee (CISC) Canadian Steering Committee on Numbering ("CSCN") revise the Canadian International Mobile Subscriber Identity Guideline ("IMSI

Guideline") such that CEA may be granted a two-digit Mobile Network Code ("MNC") to be shared amongst its CEU members;

b. The recognition by the Commission of a new type of Mobile Virtual Network Operator ("MVNO") namely a Private Mobile Virtual Network Operator ("PVNO"), which, while similar in most respects to a Full MVNO, would not offer telecommunications services to the general public, coupled with recognition that CEUs meet this definition.

2.0 <u>The electrical grid is critical infrastructure and is undergoing significant changes that require the increased and flexible use of mobile wireless networks by CEUs</u>

2.1 The electrical grid constitutes critical infrastructure

5. The electric grid is a key element of the Canada's critical infrastructure. Public Safety Canada[2] defines "critical infrastructure" as "the processes, systems, facilities, technologies, networks, assets and services essential to the health, safety, security or economic well-being of Canadians and the effective functioning of government. Critical infrastructure can be stand-alone or interconnected and interdependent within and across provinces, territories and national borders."

6. Disruptions of critical infrastructure could result in catastrophic loss of life, adverse economic effects and significant harm to public confidence.

7. Critical infrastructure is supported by a wide range of stakeholders and entities and it is not straightforward to paint a complete picture of all processes and services, but electricity underpins the proper functioning of many of the other critical services, notably Health, Food, Finance, Water, Information and Communication Technology, Safety, Manufacturing, Government and Transportation.

[2] https://www.publicsafety.gc.ca/cnt/ntnl-scrt/crtcl-nfrstrctr/index-en.aspx.

2.2 The electrical grid is evolving rapidly to meet societal needs and take advantage of new technological developments

8. The electrical grid is also under constant evolution. It is becoming increasingly decentralized with energy generated, stored and distributed closer to end customers. This is in part driven by the acceleration of renewable (e.g., wind, solar) and storage technologies. At the same time, the grid is becoming increasingly digitized. The digitization of the electrical grid allows electricity system operators and customers to control where, when, and how electricity is being used. This is critical to allow for efficient capacity planning and capital allocation.

9. Finally, the electrification of Canada is accelerating. Transportation (rail, automotive, aerospace) are gradually becoming integrated into the electrical grid. These use cases further emphasize the need for a reliable electrical grid.

10. Ubiquitous communication is essential to securing that reliability.

2.3 Efficient and effective wireless data communications constitute an increasingly important element of the electrical grid

11. There are five (5) key drivers for the use of wireless communications in electrical operations:

a. Real-time information sharing between field crews (typically for intra-utility, but also for inter-utility mutual aid including cross-border operations during emergencies);
b. Remote monitoring and control of crucial components of the distribution and transmission grids (including smart meters, fault detectors and substation management);
c. Remote monitoring of sensors in key elements of power generation (including seismic, slide, slope, flood, and other sensors);
d. Tracking of workers and assets for planning as well as optimization of incident response efforts;
e. Backup for fixed wireless microwave and wireline fibre optic telecommunications systems also used as described in items a through d.

12. Historically the electrical grid had few dependencies on public wireless communication networks. Most of its connectivity was, out of necessity, provided through separate dedicated purpose-built fixed and mobile wireless networks.[3] .

13. However, it is becoming increasingly less cost-efficient to build out dedicated wireless networks. Spectrum is a scarce resource, the build out of a physical network infrastructure is cost-intensive, and the operational cost is high. Furthermore, cellular technology has become more capable and general public network capabilities have improved to the point that it makes economic sense to explore the enterprise-wide adoption of commercial network technology for utility operations. Thanks to the standardization of LTE and 5G through the 3GPP[4] organization, cellular technology has the critical mass required to attract innovation, making it cost-efficient and ensuring that a broad device ecosystem is available. Specifically, innovation targeted for emerging public safety networks is well suited to electricity operational needs.

14. CEU field crews increasingly rely on public networks for backup communications and high-speed data transfer. Access to public networks is important for inter-utility assistance (including international support) and mutual aid assistance.

2.4 The smart grid requires extensive connectivity services that are best provided by using Canadian mobile wireless networks

15. In addition to all of the factors driving the need for connectivity that have been discussed, the most important such driver, particularly of wireless connectivity, is the evolution of electrical grids into the smart grid.

16. CEUs have deployed their electric system infrastructure over many decades. As Canadians increasingly rely on electricity for their quality of life and economic prosperity, CEUs are investing in new digital protection, automation, monitoring, and control technologies. Many of these new technologies require telecommunications to be deployed deeper and deeper into Canada's electrical grids. This new more connected grid is referred to as the "smart grid."

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[3] These alternatives include Private Microwave, WiMAX, and SCADA Radio for grid operations; P25, TETRA for Land Mobile Radio (LMR) or Mesh networks for Smart Metering have been the dominant technologies.

[4] 3rd Generation Partnership Project. See http://www.3gpp.org/.

17. The smart grid allows CEUs to deliver energy more reliably, and implement a smarter, more distributed grid. It also provides the tools for CEUs to deliver the best customer experience, as well as achieve operational and cost efficiencies, all while meeting demand securely, and reliably.

18. With emerging technologies and applications, the smart grid requires more and more devices integrated to the home. Without being exhaustive, according to CEA, a smart grid includes components such as smart meters, Intelligent Electronic Devices,[5] plus two-way communications and power flow functionalities to:

- Quickly detect outages, so as to minimize the impact on the rest of system;
- Allow power to be distributed more efficiently and reliably (including peak load shaving);
- Integrate highly variable renewable energy sources, like wind and solar;
- Manage electricity generation flow from centralized power generating stations out to consumers, or from consumers and businesses back into the grid; and
- Facilitate the integration of electric vehicles.[6]

19. CEA has attached a background paper ("CEA Smart Grid Paper") further explaining the components of the smart grid and its benefits as Appendix A to this Application.[7]

20. Smart grid technology is the necessary future of electricity generation, distribution, and transmission in Canada. Absent the deployment of smart technology, it will be very difficult for CEUs: (a) to ensure the 'always on' availability of electricity throughout the country that is so vital to the twenty-first century economy; and (b) to integrate the renewable and user-generated energy sources necessary for Canada to meet its emissions reduction targets.

21. Smart grid technology is consumer-friendly technology that, in an age of increasing costs for electricity stemming from a variety of factors, will be particularly beneficial to low and middle-income consumers by enhancing their ability to control their usage of electricity and thus the

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5 An Intelligent Electronic Device is a term used in the electric power industry to describe microprocessor-based controllers of power system equipment, such as circuit breakers, transformers and capacitor banks.

6 Canadian Electricity Association, "The Smart Grid: A Pragmatic Approach", 2010. ["CEA Smart Grid Paper"].

7 *Ibid*.

amount they are ultimately charged. For example, consumers will be able to monitor their electricity usage via an application on their smartphones and reduce their consumption during peak hours. Smart grid technology also reduces the costs of delivering power, by allowing utilities to monitor usage remotely as opposed to sending workers out to customer premises to physically check meters.

22. There is also a significant public safety element to the smart grid. As explained in the CEA Smart Grid Paper, when the power grid goes down, lives are at risk. The infamous 2003 blackout in eastern Canada and the United States caused the loss of at least eleven lives.[8] A review of the root causes of the blackout determined that the entire incident was caused by tree branches in Ohio brushing against power lines and the failure of an alarm to go off subsequently at the local utility.[9] Had smart technology been deployed throughout the grid in 2003, the voltage disruptions caused by the tree branches brushing up against the power lines would have been detected well in advance, thereby enabling the relevant utilities to dispatch workers to remove the branches before the disruptions cascaded throughout eight US states and Ontario.[10] Even if the power lines had been knocked down, smart grid technology would have allowed utilities throughout Canada and the United States to identify the source of the problem correctly, isolate the affected area to prevent the adverse consequences from cascading throughout the grid, and reroute power through other networks in order to minimize the size of the blackout.[11]

23. The smart grid has an important role to play in protecting the sick and elderly, who often use medical devices that require electrical power to operate correctly and are therefore vulnerable to disruptions in the electrical power supply.

24. Smart grid technology also enhances the safety of utility workers. During blackouts, a frequent risk to worker safety is the possibility of "islanding" where portions of the grid remain electrified by power from local generators.[12] Presently, these islands of electricity can be

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8 *Id.* at pg 10.
9 *Ibid.*
10 *Ibid.*
11 *Ibid.*
12 *Id.* at pgs 6, 8, 10.

incredibly difficult to detect and pose a constant risk to utility workers seeking to restore power to areas that otherwise appear to be completely devoid of electricity.[13] However, with smart grid technology deployed throughout the grid, utilities will be able to monitor instances of islanding in real-time actively, advise workers to take extra precautions, and shut down generators in the affected areas remotely until workers have fully restored service.[14]

25. By allowing the monitoring of power-flow, smart grid technology also enhances public safety by deterring the very dangerous, but unfortunately increasingly common, practice of electricity theft. For example, BC Hydro has had to deal with over 1,500 instances of electricity theft over three years, all associated with illegal marijuana growing operations.[15]

26. Finally, smart grid technology, by reducing the frequency and duration of outages, will dramatically benefit the economy. A 2004 study found that power interruptions cost the economy of the United States $80 billion per year and other estimates indicate that the loss was as high as $150 billion per year.[16] While the amounts in Canada would be lower due to the smaller size of Canada's economy, the negative impact is still no doubt measured in the billions of dollars per year.

27. Overall, it is vital for economic, public safety, and environmental reasons that CEUs can deploy smart grid technology throughout their grids and have access to the resources necessary to do so in the most cost-effective and reliable way possible.

28. One of the most important aspects of the evolution of the smart grid is the need for CEUs to be able to communicate with the very numerous individual devices that comprise it. CEA expects that within the next 10 to 15 years, more than 25 million wireless data devices and over 50,000 voice devices will be deployed to support the management of the electric supply by CEUs. Considering the current pace of technological evolution and rapid adoption of the Internet of Things ("IoT"), these estimates could be conservative.

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[13] *Id.* at pg 8.
[14] *Ibid.*
[15] *Id.* at pg 12.
[16] *Id.* at pg 5.

29. Clearly, the availability of ubiquitous, reliable and secure wireless communications technology is essential to the development and operation of the smart grid.

30. Since there is a high degree of overlap of coverage between the aggregate footprints of the mobile wireless networks of Canada's Mobile Network Operators ("MNOs")[17] and CEU electrical grids, it is efficient for CEUs to have their wireless data communications needs met by the MNOs. While it is possible to connect smart devices in the grid via fibre in some cases, realistically, the only way to cover the vastness of Canada's electrical grid, particularly in more rural and remote areas, is to leverage existing mobile wireless networks. Thus, many smart devices being used by CEUs today are built to contain subscriber identification module ("SIM") cards and are connected to existing mobile wireless networks of the MNOs.

3.0 The relief sought by CEA will greatly improve the management of the electrical grid

31. Leveraging commercial mobile networks can bring significant benefits to CEUs. The Commission has estimated that between 2012 and 2016 Canadian telecom providers have spent $8.7B in wireless plant and equipment and $8.9B on spectrum (AWS-3, 700MHz, and 2,500MHz).[18]

32. Clearly, CEUs do not have the capabilities to invest similar amounts of capital in mobile communication network deployments, nor is the diversion of such resources consistent with their core mandate. From an economic and societal perspective, it makes sense to maximize the use of existing assets as opposed to driving additional network deployments (unless that is necessary for specific coverage, security, reliability or capacity requirements).

33. While existing mobile wireless networks constitute a promising method of telecommunications for CEUs to develop the Canadian smart grid, unfortunately CEUs have been experiencing a number of problems under the current mobile wireless regulatory environment that

[17] Those are the entities listed as Wireless Carriers on the Commission's List of Telecommunications Service Providers. See https://applications.crtc.gc.ca/telecom/eng/registration-list?_ga=2.114163207.1818544366.1539969706-670211790.1509399832.

[18] https://crtc.gc.ca/eng/publications/reports/policymonitoring/2017/cmr5.htm.

are hindering the deployment of the smart grid in Canada. These problems are discussed below, where we also demonstrate how the relief sought by CEA will solve them.

3.1 SIM card lock-in is hampering the development of Smart Grid in Canada

34. MNOs are fostering vendor lock-in. They do this through a practice known as "SIM card lock-in". The practice ensures that SIM cards placed in devices will only connect to the mobile wireless network of the MNO that provided the SIM cards. CEUs are subjected to this practice when they obtain SIM cards from MNOs for deployment in smart grid devices.

35. This situation can be extremely problematic if the entity deploying the smart devices later decides that it wishes to switch MNOs. In such a case, the deployer of the smart devices has to physically attend, at every smart device, in order to manually remove each SIM card programmed by the previous MNO, so that it can be replaced with the SIM card programmed to connect to the network of the new MNO. The 'truck rolls' necessary for completing this task entail significant cost, which increases exponentially in the case of a comprehensive changeover. Further, there is also a risk of interruption of electricity during these activities.

36. CEUs operate millions of smart devices, including in many rural and remote areas. The cost of sending utility workers to swap out the SIM cards on smart devices in rural and remote areas, for example, could be thousands of dollars per swap. Even in dense urban areas, the sheer number of smart meters and other smart devices involved would make the cost of switching providers prohibitive for any CEU.

37. The problem of SIM card lock-in is a serious competitive constraint which makes it prohibitively costly for CEUs to consider switching MNOs for their smart devices, even if another can provide the CEU with more favourable financial or other terms than the CEU's current provider.

38. The high cost of switching SIM cards and MNOs is a variable that CEUs must factor into their business cases when deploying smart devices. Consequently, it slows down the deployment of smart devices in Canada and is an impediment to potential new innovative services that will improve control of the electric grid. If a CEU had the ability to switch MNOs so as to obtain service

from the MNO that provides the best financial and other terms, including the best quality of service, as other businesses and consumers can do, the costs of deploying and operating smart devices in Canada's power grid would be lowered and the pace of innovation and deployment could be correspondingly increased.

39. This problem is not unique to the smart devices of CEUs and has been identified by the Organization for Economic Co-operation and Development as a serious challenge to overcome to enable the widespread deployment of IoT devices (which include IoT smart devices that form part of the smart grid).[19]

40. It is imperative for CEUs to have access to a more competitive market for the provision of mobile wireless services. The relief sought in this Application would reduce the cost of switching service providers significantly, thereby giving CEUs more negotiating power when dealing with MNOs . The net result would be increased innovation and reduced costs. One of the incidental, yet very significant outcomes, will be lower electricity rates, which will, among other things, improve the international competitiveness of the Canadian manufacturing sector.

3.2 SIM card lock-in undermines redundancy in the smart grid

41. Another issue associated with SIM card lock-in is its deleterious impacts on public safety and the economy by limiting redundancy in the smart grid. SIM card lock-in makes it very expensive and overly complex to create communications redundancy in the smart grid. In the absence of the ability to program SIM cards such that a CEU could switch communications to smart devices to a secondary MNO, when there is a technical problem with the service provided by the primary CEU, the CEU would have to integrate additional communications mechanisms to achieve high availability and seamless switching between communication paths, and that could certainly push additional complexity in to the smart grid devices.

42. As described above, minimizing the frequency and duration of outages is vital to Canada's public safety and the country's economy. Smart devices in the power grid help minimize the

[19] Organization for Economic Co-operation and Development, *OECD Digital Economy Outlook 2015*, http://www.oecd.org/internet/oecd-digital-economy-outlook-2015-9789264232440-en.htm, at pg 252.

duration and frequency of outages by: (a) allowing CEUs to detect problems in the grid before they transform into a full-blown outage; and (b) enabling CEUs to pinpoint the sources of the problems in the grid precisely when outages do occur, thus allowing for resources to be focused on those problem areas instead of time being wasted while first trying to determine the cause of the problem. Obviously, for these benefits of the smart grid to be realized, the smart devices in the grid need to be able to provide data to CEUs via telecommunications.

43. A frequent issue encountered by CEUs is the inability to communicate with smart devices deployed throughout the grid due to either planned or unplanned outages in the networks of the MNOs contracted to provide connectivity to the smart devices. CEA understands that unplanned outages can occur in the networks of MNOs for a variety of reasons. However, in CEA's experience, it is rare for all the mobile wireless networks in a given area to experience an outage at the same time. Usually at least one mobile wireless network will still be offering service, even if others are down. Accordingly, if smart devices could have access to two or more networks, network availability would clearly be increased.

44. Unfortunately, due to SIM card lock-in, smart devices deployed throughout the grid will not automatically connect to the mobile wireless networks that are still functioning in a given area and use a still functioning network as a new home network. CEA notes that there is no technical justification for this state of affairs; it is merely the business decisions of the MNOs that result in this lack of redundancy existing in the smart grid.

45. This is a serious reliability issue that compromises public safety and has negative economic impacts by hindering the ability of CEUs to monitor and respond to issues in the grid. CEUs face losing visibility into the power grid if they are solely reliant on a single MNO that experiences an unexpected outage and there is no ability for the CEU's smart devices to switch seamlessly onto still functioning mobile wireless networks.

46. Electric utilities are deemed to be critical infrastructure providers by Public Safety Canada and are subject to the National Strategy for Critical Infrastructure, the purpose of which is to strengthen the resiliency of critical infrastructure in Canada in the face of current and emerging

hazards.[20] Accordingly, the current lack of redundancy in CEU's smart devices is highly problematic.

47. In summary, SIM card lock-in, by tying a CEU's smart devices to the network of only one MNO which may experience planned or unplanned service outages, is undermining redundancy by creating single points of failure in the smart grids of CEUs. It is imperative that CEUs smart devices have the ability to automatically connect to still functioning mobile wireless networks in the event that the primary home network of a smart device experiences an outage. The relief sought by CEA in this Application would enable this to occur.

3.3 CEUs need to be able to deploy and interconnect their private networks with the networks of MNOs

48. Aside from the competitive and redundancy issues associated with SIM card lock-in, CEUs have issues with extending mobile wireless network coverage in rural and remote areas not served by MNOs in which the CEUs may have electrical infrastructure.

49. CEA does not necessarily expect MNOs to expand their networks so the entire Canadian electrical grid is served by commercial mobile wireless networks. In many cases, CEUs already deploy their own telecommunications networks. In places where MNOs do not offer cellular coverage, CEUs could deploy their own private wireless networks. However, numbering resources (IMSI / MNC) are required to do so using 3GPP technology.

50. Where coverage is not available from MNOs, a CEU should be able to deploy its private network and interconnect with the existing networks of MNOs in the areas in which they do offer service to the public. The relief sought by CEA in this Application would enable this to occur.

[20] Public Safety Canada, *National Strategy for Critical Infrastructure*, 2009, at pg 2.

3.4 CEUs must be able to secure the smart grid and protect the privacy of confidential information

51. The deployment of the smart grid inherently involves significant security and privacy risks. Each smart device constitutes a potential vulnerability that could be hacked by malicious actors to gain access to confidential information or used as a gateway to attack the rest of the smart grid. These privacy and security concerns are mounting significantly as millions of smart devices are being deployed throughout Canada's power grid.

52. Some security issues are related to the control of the SIM card credentials, also known as security keys, and subscription databases owned and controlled by the serving MNO core networks. CEUs have no control over these aspects and rely completely on the serving MNO to which the SIM card is associated.

53. Without control of the SIM card and Packet Data Network Gateway, CEUs are not able to protect their control systems from network layer attacks. For example, without the SIM card security keys, CEUs have no way of knowing whether a device connected to their networks actually belongs to the CEU or is a device that is operated by a malicious actor. With control of these security keys, CEUs will be able to prevent devices operated by malicious actors from connecting to their networks, thereby ensuring the security of the smart grid. Consequently, CEUs need their own isolated core networks to have control over device and subscription related security aspects while also ensuring the required redundancy and reliability discussed above by being connected to more than one MNO's Radio Access Network ("RAN").

54. CEA has attached as Appendix B to this Application a diagram demonstrating how if they are permitted to operate as PVNOs with their own shared two-digit MNC, CEUs will be able to deploy their own core networks with the key security elements described above, safely under their own control and subject to utility-grade security standards.

55. Accordingly, the relief sought by CEA in this Application, namely allowing CEUs to access a unique two-digit MNC administered by the CEA and permitting CEUs to operate as PVNOs, will address the security concerns by allowing CEUs to develop their own core networks.

4.0 A shared two-digit MNC for CEUs will overcome the obstacles that CEUs are experiencing and that impede the development of smart grid in Canada

56. CEA wishes to emphasize that Canada's MNOs are valued business partners who obviously have a vital role to play in the deployment and development of Canada's smart grid. However, current technical and regulatory limitations have hampered CEU's ability to fully leverage the capabilities of Canada's MNOs and have frustrated the timely development of Canada's smart grid. Fortunately, as explained below, there is a simple solution to the problems identified in Part 4.0 above that would help resolve both technical and policy matters: allowing CEUs to share a two-digit MNC.

57. As noted above, to facilitate the necessary deployment of the smart grid in Canada, CEA is requesting that the Commission issue an order directing that the CSCN revise the IMSI Guideline such that CEA may be granted a unique two-digit MNC to be shared amongst its CEU members. CEA would be responsible for providing access to this two-digit MNC to its CEU members.

58. The Commission explained the purpose of an MNC in Telecom Decision 2015-496[21] ("TD 2015-496") as follows:

> An MNC is a unique identification number that identifies a specific wireless service provider's (WSP) network in a given country. The MNC permits a WSP to establish direct roaming agreements with both domestic and international providers because its network can be uniquely identified.[22]

59. If CEA is allocated a two-digit MNC, CEUs will be in a position to share this MNC with its CEU members which, in turn, will be able to deploy their own SIM cards in smart devices, as well as implement the appropriate systems/networks under their own control and negotiate the necessary corresponding commercial agreements with MNOs.

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[21] Telecom Decision CRTC 2015-496, *CISC Canadian Steering Committee on Numbering – Revised Canadian International Mobile Subscriber Identity Guideline*, 6 November 2015 ["TD 2015-496"].

[22] *Id.* at para 2.

60. Having their own MNC, and commercially negotiated service agreements with multiple MNOs in the same area, will allow CEUs to let smart devices select the proper mobile network automatically and switch to another network when quality of service is inadequate or in case of major network failures. It is this ability of an MNC to allow the devices to be directly managed by the CEUs, which CEA believes will solve many the problems identified in Part 3.0 of this Application.

61. With their own MNC, CEUs will be able to overcome the obstacles caused by SIM card lock-in. A unique two-digit MNC, shared amongst CEUs, will allow CEUs to install their own SIM cards in their smart devices, as opposed to SIM cards programmed by the contracted MNO.

62. By having their own SIM cards, CEUs will be in a position to negotiate more competitive pricing for smart devices as mobile wireless service providers will know that CEUs will have the capability of moving to another provider instead of being locked-in due by prohibitive costs arising from the need to physically switch SIM cards on multitudes of deployed smart devices.

63. SIM cards belonging to CEUs with a shared MNC belonging to CEA will also make it possible to address the redundancy issue described in Part 3.0. Currently, if the home network of a smart device experiences an outage, that device does not automatically switch to another mobile wireless network that may still be functioning. This is a serious problem. It means that CEUs lose the enhanced automation and control of their grids provided by cellular enabled smart devices during the outage of the home network.

64. However, with a unique two-digit MNC belonging to CEA, individual CEUs will be able to enter into agreements with MNOs such that if one mobile wireless network in a given area fails, the smart device will switch to alternative mobile wireless networks that are still functioning. Without a unique two-digit MNC, CEUs are unable to enter into these agreements directly and must rely on inter carrier agreements, which effectively precludes their smart devices from being switched to alternative home networks in the event of an outage in the primary home network of the smart device.

65. With an MNC it will also be easier for CEUs to interconnect their private cellular networks with MNOs' networks, in areas where MNOs do not offer coverage so that a CEU can deploy smart devices within its own network. This will ensure that those devices can communicate with the rest of the smart grid, which is served by other MNOs. In this way, the geographic scope of the smart grid will not be unduly constrained.

66. As explained in previous sections, there are security issues related to the control of the SIM card credentials and subscription databases, which are currently owned and controlled by the serving MNO's core network. CEUs currently have no control over these aspects and rely completely on the serving MNO to which the SIM card is associated. With an MNC belonging to CEA, a CEU would be able to have an isolated core network under its own control, connected to more than one RAN, and have control over security aspects while ensuring redundancy and reliability.

67. Overall, if CEA acquires its own unique two-digit MNC, which it will share amongst its CEU members, it will be able to overcome the obstacles noted in Part 3.0 of this Application, which are hindering the deployment and development of the smart grid in Canada. However, as explained further below, CEA will only be able to obtain an MNC through regulatory change.

5.0 Regulatory change is needed for CEA to acquire an MNC and be granted PVNO status

68. The allocation of MNCs in Canada is governed by the ISMI Guideline.[23] Currently, the ISMI Guideline is drafted in a restrictive fashion such that, although they have a bona fide need for an MNC, CEUs are unable to currently receive an MNC from the ISMI Administrator.

69. The following subsections of the IMSI Guideline prevent CEA from applying for an MNC on behalf of its CEU members:

[23] TD 2015-496 at para 2.

7.1 The MNC applicant must be one of the following:

a) an entity who is licensed by Industry Canada for the spectrum utilized by a wireless network and be registered as a telecommunications carrier with the CRTC to operate in the area in which it intends to provide a mobility service, and who provides evidence of certification to the IMSI Administrator.

b) A public safety related association that has a need to roam onto/from telecommunications carriers' networks in Canada may also be an applicant for an MNC. See Appendix 2.

c) an entity registered with the CRTC as a Full MVNO.

[….]

7.3 The applicant must certify that the MNC will be used for mobile applications. That is, the applicant must certify that the service provided will have the following characteristics:

a) Terminal Mobility – The ability of a terminal to access telecommunication services from different locations and while in motion, and the capability of the network to identify and locate that terminal.

b) Personal Mobility – the ability of a user to access telecommunications services at a terminal on the basis of a personal identifier, and the capability of the network to provide those services according to the user's profile. Personal mobility involves the network capability to locate the terminal associated with the user for the purpose of routing.

[….]

Appendix 2

1. The IMSI Administrator will assign a single, common Mobile Network Code (MNC) for use by all Industry Canada authorized 700 MHz public safety broadband network operators.

2. In addition to the allocation of the single public safety MNC, the IMSI Administrator is authorized to set aside additional MNCs for use by public safety if justified to the IMSI Administrator, CRTC staff and Industry Canada staff.

70. Unfortunately, CEA does not fit neatly into any of the categories required to obtain an MNC under the ISMI Guideline. CEA does not qualify under subsection 7.1(a) as neither it, nor

all its members, are telecommunications carriers for mobility services. CEA also does not qualify under subsection 7.1(c) as neither it, nor its members, are Full MVNOs.

71. CEA closely examined the possibility of applying under subsection 7.1(b) as a public safety related association. Certainly, one of the roles of CEA is advancing public safety and, as detailed above, CEUs play a vital role in public safety through their efforts to maintain the integrity of Canada's supply of electricity. In addition, CEA is participating in consultations related to the 700 MHz public safety broadband network ("PSBN") and expects CEUs to be included as users and/or operators of that network.

72. However, as the PSBN is not yet established, it is not certain that CEU will achieve the desired level of network access and control on a permanent basis.

73. In any event, even if CEA was considered by the Commission to be able to apply for an MNC under subsection 7.1(b) of the ISMI Guideline, CEA's application would still be stymied by the restrictive requirements of subsection 7.3 of the ISMI Guideline, which require that a MNC be used for "mobile applications." Subsection 7.3(a) of the ISMI Guideline specifically requires that an applicant for an MNC use it for "terminal mobility", namely the ability of a terminal "to access telecommunication services from different locations and while in motion." This is a problematic and restrictive definition for CEA as the smart devices that make up Canada's smart grid are mostly fixed in place, although they rely upon mobile wireless networks and technology for connectivity.

74. Thus, CEA would propose the following amendments to the ISMI Guidelines in order to facilitate the granting of an MNC to CEA and all the benefits that will flow from such a grant:

a. Subsection 7.1 amended to add a new paragraph (d) that reads: "An Electric Utility related association, some of whose members operate as PVNOs, may also be an applicant for a two-digit MNC to be shared amongst its members who operate as PVNOs."

b. Subsection 7.3(a) amended to read: "The ability of a terminal to access telecommunication services from mobile wireless networks, regardless of whether the terminal itself is in motion or not, and the capability of the network to identify and locate that terminal."

c. Section 15.0, the Glossary, amended to add a new definition of PVNO as follows: "Private Virtual Network Operator (PVNO): is a full MVNO that only provides telecommunication services to itself and not to consumers, operates core network hardware (e.g., switches, routers) separate from all WSPs and has a service profile management system (e.g. Home Location Register [HLR], Home Authentication, Authorization, and Accounting [AAA], or Home Subscriber System [HSS]) for devices owned and/or operated by the PVNO that can access WSP networks in Canada."

75. As noted above, CEA is proposing that the Commission recognize a new category of wireless service provider, namely PVNOs. A PVNO would be the same, technically, as a full MVNO. However, it would not provide mobile wireless services to consumers, but only to itself (namely for private enterprise needs and internal telecommunication purposes). As such, there should be no requirements for PVNOs to adhere to any of the consumer-centric obligations imposed on MVNOs or wireless carriers such as wireless number portability. CEUs would be recognized as PVNOs.

76. CEA notes that while it would be the entity applying for a unique two-digit MNC, this MNC would then be shared among its CEU members who operate as PVNOs.

77. CEA is open to working with the Canadian Steering Committee on Numbering (CSCN) to further modify the proposed modification to the ISMI Guideline set out above, as well as any other consequential amendments required to the ISMI Guideline, so long as it enables CEA to obtain the necessary two-digit MNC so that its CEU members can share the MNC and operate as PVNOs so that CEUs can use smart devices more efficiently.

78. Regulatory action on the part of the Commission is required for CEA to obtain a shared two-digit MNC for its CEU members that will allow them to operate as PVNOs and access and operate reliable cellular communications systems to support the build out of a cost-effective communications infrastructure for smart grid applications in Canada.

6.0 Other jurisdictions are granting or considering granting MNCs to electrical utilities

79. CEA is aware of at least one other national telecommunications regulator that has granted the relief that CEA is now seeking in this Application. The national telecommunications regulator of The Netherlands created a shared MNC to be used by public utilities and recognized a new category of mobile wireless service provider, namely PVNOs.[24]

80. The Dutch electrical and gas utility Enexis has taken advantage of the opportunity to have its own MNC, independent of the control of the telecommunications companies, to facilitate its roll-out of smart devices throughout its grid.[25] Further, Enexis indicated that the PVNO solution, in which it has access to a shared MNC, allows it to avoid the issue of SIM card lock-in.[26]

81. Other European jurisdictions, namely Belgium and Germany are also considering following the Dutch model and assigning MNC's to electrical utilities.[27] In fact, Europe's Electronic Communications Committee, which is responsible for coordinating spectrum and numbering policy across Europe, issued a report in 2014 which specifically contemplated the possibility of national regulators providing MNC's directly to utilities:

> According to Recommendation ECC/REC/(11)03 on "Numbering and Addressing for Machine-To-Machine (M2M) Communications", M2M is a communication technology where information can be transferred in an automated way with little or no human interaction between devices and applications.
>
> Machine-To-Machine (M2M) communications offer promising opportunities for new and existing market players and the M2M supply chain may vary depending on the nature of the service, the size of the M2M customer (i.e. number of M2M devices) and whether services are provided on a national or global basis. For illustrative purposes we use three examples where E.212 resources are required and where the MNC assignment may be made directly to the end customer, to a specialist intermediary or using the existing MNC and IMSI resources of the underlying mobile network operator.

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[24] Enexis, "Enexis Private MVNO Solution" Presented 5 November 2015 at European Utility Week, https://www.engerati.com/sites/default/files/eventpres/151105%20Enexis%20Private%20MVNO%20solution%20PUBLISH_0.PDF, at pg 18 ["Enexis Presentation"].

[25] Enexis Presentation, at pg 24.

[26] Enexis Presentation, at pg 24.

[27] Organization for Economic Co-operation and Development, *OECD Digital Economy Outlook 2015*, http://www.oecd.org/internet/oecd-digital-economy-outlook-2015-9789264232440-en.htm, at pg 253.

[….]

A utility company may deploy millions of smart meters at customer premises over a wide geographic area. If the utility company wishes to move to a new MNO on better commercial terms or for improved network coverage it would need to swap out the SIM card in each of its millions of meters. Visiting each meter would be cost prohibitive and logistically impracticable. Therefore, a network "lock-in" effect is introduced which could have a distortive effect on competition in the market. If the utility company has its own MNC and unique IMSI range then the barrier to switching could be reduced as changes to network systems could be made to facilitate the change rather than through the physical replacement of SIM cards.

Communications for smart metering is essential to facilitate customer billing but it is also an integral component in the development of smart grids. In the future, communications with smart meters will become more critical and utility companies will demand uninterrupted communications by having network redundancy arrangements in place through national roaming agreements. By having its own MNC and unique IMSI range, the utility company could enter into national roaming agreements with all the available network operators to ensure uninterrupted communications. The social and economic benefits of smart metering and smart grids should be considered in assessing the need for MNCs for this purpose.[28]

82. Domestically Canadian Researchers and Manufacturers have been promoting the PVNO operating model for electricity management. In 2014, IREQ and Ericsson published an article in IEEE Canadian Review describing the benefits of the PVNO operating model for Canadian Electric Utilities.[29]

83. Based on all of these developments, it is clear that CEA's requested relief is not radical, nor unprecedented. Utilities have successfully been granted their own MNC in The Netherlands and other European regulators are also examining the possibility of providing utilities with MNCs to facilitate the "social and economic benefits" of the smart grid.

[28] European Conference of Postal and Telecommunications Administrations, Electronic Communications Committee, *ECC Report 212*, 9 April 2014, at pgs 18-19.

[29] Basile, et al. "*LTE for Smart Grid Communication The Canadian Outlook*", *IEEE Canadian Review, 2014*, at pgs 26-29. See http://canrev.ieee.ca/cr72/ICR72_SmarterGrid-LTE.

7.0 The relief requested by CEA advances the policy objectives and is consistent with the Policy Direction

84. The relief requested by CEA advances the policy objectives in section 7 of the Telecommunications Act and is consistent with the Policy Direction.[30]

85. CEA's requested relief will advance the following policy objectives:

a. The policy objective in subsection 7(a) will be advanced as the smart grid will provide more reliable and more affordable electricity for all Canadians than is currently available from the present power grid, thus advancing the economic and social fabric of Canada and its regions.

b. The policy objective in subsection 7(b) will be advanced as significant amounts of Canada's telecommunications infrastructure and devices rely upon electricity generated and delivered by CEUs. By improving the reliability and affordability of electricity in Canada, the smart grid will also enhance the quality of telecommunications services in Canada by ensuring that telecommunications devices and infrastructure are always able to function.

c. The policy objectives in subsection 7(c) and 7(f) will be advanced by addressing the problem of SIM card lock-in. SIM card lock-in severely limits the ability of CEUs to switch between mobile wireless carriers and is therefore a bar to effective competition. In effect, a single carrier can lock in a utility customer for years even if another carrier offers better rates or service due to the high cost of switching associated with locked-in SIM cards. If a carrier has an effective monopoly on the smart grid business provided by a CEU once it wins the initial contract, then, by definition, neither competition nor market forces are present.

d. The policy objective in subsection 7(g) will be advanced by the relief requested by CEA by placing Canada at the forefront of innovation when it comes to smart devices. The requested relief will also give Canada a vital competitive edge in the race to deploy smart grids.

e. The policy objective in subsection 7(i) will be advanced by addressing security issues and privacy of customers as CEUs would be in a position to have isolated core networks under their own control, with their own subscriber databases and management tools, thereby giving the CEUs control over all the security aspects of the service.

[30] *Order Issuing a Direction to the CRTC on Implementing the Canadian Telecommunications Policy Objectives*, SOR/2006-355 ["Policy Direction"].

86. The relief requested by CEA is also consistent with the Policy Direction. By addressing the problem of SIM card lock-in, the relief will enhance competition as well as increase reliance on market forces.[31] Obviously, if a mobile wireless service provider has an effective monopoly on the provision of service to a CEU's smart devices, there can be no competition or reliance on market forces.

87. The relief is also efficient and proportionate and only requires minor changes by the Commission to definitions in the ISMI Guideline to enable CEUs to obtain their own MNCs,[32] and the creation of a PVNO category.

88. The relief sought is also competitively neutral and does not favour any particular technology, carriers, or "resellers".[33]

89. Overall, CEA's requested relief advances the policy objectives in section 7 of the *Telecommunications Act* and is consistent with the Policy Direction.

8.0 Conclusion

90. Canada's power grid, while still enviable by many international standards, needs upgrading to meet the energy needs of the country in the twenty first century. The Canadian economy demands 'always on' reliable and affordable electricity. Governments are requiring CEUs to reduce their carbon emissions and deliver energy more efficiently. Individual consumers want more control over how they consume electricity and, in some cases, to sell electricity that they generate, for example, via solar panels, back to CEUs.

91. To meet these demands, CEUs need to invest in transforming their individual grids, which collectively make up the network of networks that is Canada's national electrical grid, into a smart grid. This transformation requires the deployment of millions of smart devices connected to mobile

[31] Policy Direction at ss 1(a)(i)-(ii).
[32] Policy Direction at s 1(a)(ii).
[33] Policy Direction at s 1(b)(iv).

wireless networks throughout the grid to remotely monitor and modify the flow of electricity throughout the grid as necessary.

92. Unfortunately, the issue of SIM card lock-in stemming from CEUs' inability to operate their own MNC is slowing the development of Canada's smart grid by imposing significant costs and hindering the establishment of redundancy throughout the smart grid. CEUs also have significant security concerns stemming from their inability to control the security certificates associated with SIM cards that they currently receive from the MNO with whom they contract provide connectivity to their smart devices.

93. However, these obstacles will be overcome, and the deployment of the smart grid in Canada facilitated, by the Commission enabling CEA to obtain a unique two-digit MNC to share amongst its CEU members, which is the principal relief requested by CEA in this Application. In order to achieve this result, CEUs will also need to be granted PVNO status.

94. With their own MNC, CEUs will be able to avoid the problems associated with SIM card lock-in, interconnect their private networks with those of other MNOs, ensure that security protocols meet utility standards, and ensure the best network reliability possible.

95. The relief sought by CEA is not only technically feasible, but it has already been implemented in The Netherlands and is being examined by national telecommunications regulators in other European jurisdictions.

96. Consequently, CEA urges the Commission to grant its request for relief in this Application and allow it to have access to a unique two-digit MNC to be shared amongst its CEU members.

97. By enabling CEA to have its own MNC, the Commission will be clearing the way for CEUs to continue deploying smart devices throughout Canada's power grid in order to transform it into a true, twenty-first century, smart grid, with all the associated benefits for reliability, affordability, the environment, and public safety that the smart grid entails.