

Attn: Director General

Engineering, Planning and Standards Branch
Innovation, Science and Economic Development Canada
6th Floor, 235 Queen Street, Ottawa, Ontario, K1A 0H5

In the Matter of)
)
Consultation on the Licensing Framework for Non-)
Geostationary Satellite Orbit (NGSO) Systems and) Notice Reference No. SMSE-009-17
Clarification of Application Procedures for All)
Satellite Licence Applications)

**KEPLER’S RESPONSE TO COMMENTS ON
CONSULTATION ON THE LICENSING FRAMEWORK**

Kepler Communications Inc. (Kepler)¹ is delighted to see the number of participants that responded with comments and suggestions to ISED’s Consultation² on proposed changes to the regulations surrounding the use of *large* non-geostationary satellite orbit (NGSO) fixed-satellite service (FSS) systems. It came as no surprise that a large group of the commenters also filed in the FCC’s Notice of Proposed Rule Making³ (NPR). Kepler applauds the Canadian Satellite and Space Industry Forum (“CSSIF”) for highlighting ISED’s mission statement and drawing particular attention to its motto of *build[ing] a fair, efficient and competitive marketplace*. While the notion of fair is always biased in the eye of the beholder, efficiency and competitiveness are metrics that can be measured. As such, Kepler has assessed the comments of the other parties on the basis of driving economic value to Canada by virtue of efficient satellites that promote competition to the benefit of the People of Canada.

Itemized below, in line with the structure laid out by ISED, is Kepler’s response to the comments and concerns filed by other operators and industry bodies.

¹ The Kepler System is an innovative new paradigm for satellite communications. It leverages nearly 16 years of on-going development towards the CubeSat standard. Using this standard in combination with a novel, proprietary, Software Defined Radio (“SDR”) and electronically steerable antenna array, the Kepler System will deliver cost effective real-time connectivity for the billions of devices that gather the world’s information.

² See *Canada Gazette Part I, Vol. 151, Consultation on the Licensing Framework for Non-Geostationary Satellite Orbit (NGSO) Systems and Clarification of Application Procedures for All Satellite Licence Applications, Notice No. SMSE-009-17 (Mar. 2, 2017)*

³ See *Update to Parts 2 and 25 Concerning Non-Geostationary, Fixed-Satellite Service Systems and Related Matters, IB Docket No. 16-408 (Dec. 15, 2016)*

A. Limit on the number of licences per band

1. There do not appear to be any substantiated arguments in favour of limiting the number of licences. Kepler supports the recommendation made by SpaceX, which suggests to promote operators *striv[ing] for maximum interoperability and spectral efficiency*⁴. While interoperability provides a direct measure of potential competitiveness in the market, spectrum efficiency is likely to be system dependent and more of a relative measure. Should ISED determine that such an approach is best, it will likely need to define efficiency relative to the nature of the system which would best be defined by further commenting⁵.
2. Telesat has noted that it does not support licenses receiving compensation for their services outside of the normal framework⁶. On the surface this would appear to be a logical argument, however Kepler wishes to make the following arguments that highlight the need for leniency:
 - a. While established operators will either have existing capital or the ability to leverage significant capital to invest in new deployments, the same is inherently not true for new or smaller operators.
 - b. The ability for new operators to generate revenue from *developmental* deployments can be a critical component to securing future capital or subsequent rounds of investment. The demonstration of a market willing to pay and the ability to demonstrate that such revenue is scalable, typically plays a fundamental role in the promotion of investor confidence.
 - c. Rules typically exist within governments that prohibit the offering of a free service or one which is not offered on par with what the open market would pay. Amongst others, such rules exist to deter corruption through gifting from the industry. Governments and the underlying bodies affiliated with government can play a significant role in the development of an industry – excluding them from having access to early demonstrations of space technology does not support ISED’s mission to *improve conditions for investment [and] enhance Canada’s innovation performance*⁷.

⁴ See SpaceX comments, *par 6*

⁵ Kepler does not support any further extension of the moratorium in order to seek further comment. Should ISED require further input, Kepler suggests it does so after lifting the moratorium.

⁶ See Telesat comments, *par 37*

⁷ See CSSIF comments, *par 3*

- d. Telesat has noted that such a license may not cause any harmful interference and must accept all interference from licensed commercial networks. In essence operating under a non-interference, non-protection basis and fully protecting the interest of incumbent systems. This alone would force any new operator to progress onto a full “normal framework” license if it truly intended to establish a sustainable⁸ operation.
 - e. Given the aforementioned protection to Telesat and other operators interests, Kepler is of the strong belief that leniency on developmental/tailored licenses could contribute to improved investment towards space innovation within Canada. That being said, Kepler agrees with Telesat’s position on ensuring there is no gamification of such a license. ISED should ensure that any provisions for such a license be well defined and potentially place a cap on the number of satellites and allowed revenue⁹ before a mandated transition to a *normal* license is imposed.
3. In summary; Kepler does not believe that limiting licenses will result in an efficient nor competitive landscape. However, the introduction of leniency on licenses could result in additional competition within Canada and further innovation.

B. Canadian Direction and Control

4. CSSIF has made a very valid point in noting that the fees associated with both earth stations and space stations are significantly higher than in the US¹⁰. If Canada is to compete globally, let alone locally – the costs must align with its neighbours. Failure to implement such a competitive regime would detriment ISED’s ability to drive economic value to Canada.
5. Based on the other comments submitted, Kepler does not believe there is adequate support to mandate Canadian based ground operations. Kepler is also in agreement with Telesat’s comment that *it may not be appropriate to require that all [...] facilities be complete at the time the first satellite is brought into operation*¹¹. Regardless of ISED’s choice on whether to mandate a Canadian based ground network or

⁸ In this case referring to the ability of an operator to continue unhindered commercial expansion

⁹ Revenue would likely need to be defined as a percentage of system expenditure which would be hard to gauge unless correlated to the physical cost of the goods and launch.

¹⁰ See CSSIF comments, *par 22* and *par 29*

¹¹ See Telesat comments, *par 45*

not, Kepler would recommend that at the very least this is not an imposed requirement due at the launch of the first satellite.

6. In summary; Kepler sees no added value to mandating Canadian based direction, control or gateways other than enabling satellites without inter-satellite links to seize emissions. The argument that this may support the Canadian economy is contrasted with the potential for systems to exclude Canada from their service.

C. Canadian Coverage

7. Noting ubiquitous coverage for all Canadians regardless of location as a reason, OneWeb has stated that it prefers to maintain the mandate of complete coverage over Canadian territory¹². With the plethora of proposed systems, Kepler is of the strong belief that where one operator chooses not to provide coverage, another is bound to step in. This is especially true when the licensed systems are capable of sharing spectrum. Strangely, within the scope of this question OneWeb appears to change its stance of *allowing business decisions to drive constellation planning and design*¹³.
8. Rather than mandate 100% coverage on a 24/7 basis, ISED could consider providing spectral incentives to systems that are capable and opt to provide 24/7 based coverage over Canada. Kepler still believes that the application of such an incentive be geared towards systems that facilitate simple coordination.
9. Telesat appears to further support the above and of particular note, Telesat highlights that mandated coverage should be based on the capability of a system to provide coverage rather than ability to blanket the surface of the earth with emissions. While Telesat supports the requirement for territorial coverage in order to prevent cherry picking of denser and potentially more profitable markets¹⁴, Kepler believes that the positions presented by Telesat and OneWeb are likely to cause more harm than good - as noted in the SpaceX comments referenced below.
10. SpaceX makes a relatively valid point in mentioning that the majority of Canadian land mass is unpopulated. Arguably, the use of spot beams to target communities rather than spread emissions over unserved areas may thus make for a better use of spectrum – provided ample systems are available to

¹² See OneWeb Comments at C. *The Record Indicates There is Not Adequate Support for Removing the Domestic Coverage Requirement.*

¹³ See OneWeb comments, *par 6* of FCC filing

¹⁴ See Telesat comments, *par 50-54*

serve all areas required. This also creates a very interesting argument for potential coordination difficulties between a wide beam system serving a bent pipe market and a store and forward spot beam system. The latter is likely to have stations based in unpopulated remote areas but could be penalized by the former system in coordination attempts, even if the former has no stations to serve in the area.

11. As seen in Kepler's initial comments, such a requirement does not make sense for all types of systems and on balance, as well as in view of the other comments filed both in the NPR and this Consultation, Kepler still believes that it is in Canada's best interest to remove the requirement. Should ISED choose not to do so, it will likely require specifying which system types such a regulation would apply to.

D. LEO Capacity

12. ISED has received a fair amount objection to the capacity requirements set out in the proposition. Kepler maintains its original proposition that ISED should operate a public database wherein reserved capacity is listed for Canadians to use.
13. Furthermore, it should be reiterated that ISED differentiate between the reservation and the allocation of capacity. Provided that capacity is not allocated and not in demand, the capacity may be used by non-Canadian users – this capacity would still be reserved for Canadian use and foreign clients would have to forfeit their capacity if required.
14. The above would not adversely affect any Canadian system provided foreign licensed systems are required to do the same.
15. As CSSIF pointed out in *par 35* of their comments; *there is more than ample FSS capacity available*. Any reservation of spectrum is therefore unlikely to be detrimental to an operator or jurisdiction. Quite on the contrary – it would merely ensure that in the event that spectrum could be used within Canada and that there is demand (an allocation), an operator would not be able to use that bandwidth outside of Canada. Kepler strongly disagrees with the notion that any such regulation would result in a less competitive landscape for Canadian operators, provided a clear distinction between reservation and allocation is defined.
16. In the event that ISED implements a reservation/allocation policy, it should seriously consider the effect it could have on revenue. Through the introduction of reservation, ISED would create an artificial

market of excess supply. Where this could become problematic is if a system has not fully allocated its Canadian reservation and is selling capacity into the US – in the event that a Canadian system seeks to utilize the remaining reserved capacity, would they be expected to compensate the provider at the same rate as the US customer? If not, the Canadian customer could refuse to adequately compensate the provider given the knowledge of regulations which mandate providers must favour the Canadian customer over the US customer.

17. Based on the above, ISED should create a framework that does not allow for the extortion of a provider based on the knowledge of reserved capacity. With that said, whether or not the establishment of such regulation lies within the purview of ISED is certainly questionable. Kepler maintains that if there is a differentiation between allocation and reservation, reservation surrounding spectrum over Canada is unlikely to cause any detriment to operators.

E. Removal of coexistence as an assessment criterion

18. There currently appear to be three general positions in terms of assessing priority and how systems could coordinate:
 - a. ITU priority has been provided as one means by which priority could be assigned. The issue with such a proposal is that it provides the first filed system with absolute power to control any further access to the spectrum. In essence, a single system becomes the gatekeeper to all coordination. Unlike GEO, NGSO's are typically global systems by design. ISED should understand that if the first system (System A) has ultimate priority over potential subsequent systems (System B and System C), even if System B and System C can come to a coordination agreement, System A will still have the ability to control and/or manipulate the agreement as they control access to the spectrum for both subsequent systems. The regulations in place at the ITU were never meant to support the size of NGSO's currently being envisioned and Kepler strongly believes that ITU priority would lead to a closed marketplace not only in Canada but globally. This would inherently go against ISED's principle of *driving innovation*.
 - b. Mandated Coordination or "coexistence" is not a plausible solution for the size of NGSO being proposed. While coordination with existing GSO and/or a few other NGSO may be *relatively* simple, the notion of coordinating two or more NGSO mega-constellations is unfathomable and to Kepler's knowledge, has not been explored at the ITU to date. Any commenter that

- believes and subsequently suggests ITU Coordination be used as a tool to facilitate access to a market should demonstrate and publish the software used to coordinate multiple NGSO systems. GHGSat has given a real-world example in their comments of how coordination has been used as a road block rather than a constructive method to coexist¹⁵.
- c. The only method that makes sense and incentivises spectrum sharing through coordination is band segmentation. In essence, every potential operator is provided an allotment of the total spectrum (“Home Band”) which is reserved for their use. This reservation of spectrum can take two paths with regards to implementation:
- i. The Home Band is the only spectrum allowed to be used by the operator until they have reached a coordination agreement with parties that have been allotted other Home Bands. These two operators can subsequently use each other’s spectrum allotments by what ever means they have agreed.
 - ii. Conversely, the entire spectrum could be allocated to operational systems and a Home Band granted where inline events occur. Arguably this may be a higher risk option in that a system may cause interference to another’s Home Band prior to being informed of the interference and subsequently being required to coordinate.
 - iii. Consideration: While unlikely, it is possible that an operator split part of its spectrum allotment with multiple other operators and either accidentally or purposely provide the other operators with overlapping spectrum¹⁶. The resulting question becomes whose responsibility is it to ensure that the shared spectrum is not being abused by either party. A public register of agreements may be required such that there is no ability to oversubscribe shared spectrum.
- d. O3B and Boeing have both supported the notion to implement band sharing as a method to encourage coordination¹⁷. A provision that should be implemented to prevent spectrum warehousing with Home Band allocations is to only make the allocation effective once a

¹⁵ See GHGSat comments, *par 4) a*.

¹⁶ As an example, if 11.0 - 11.2 were allocated as a Home Band to a single operator, this operator could chose to always hold on to 11.0 – 11.1 for themselves and offer up 11.1 – 11.2 to all other operators without ensuring the other operators can effectively share the 100MHz allocation amongst themselves.

¹⁷ See Boeing comments, *par 18 & 19* – and O3B comments, *par 10*

satellite has been notified and/or brought into use. The allocated Home Band(s) of a new system(s) would be equally distributed amongst operational providers until the new system is launched and can start using its provisioned spectrum. Given the aforementioned, along with the proposal of reducing filings to the number of operational satellites if milestones are missed, and subsequently making them subject to non-interference/non-protection, the argument of spectrum warehousing would appear to be resolved.

19. In summary; Kepler is of the strong belief that band segmentation is the only viable way to ensure equitable access to spectrum and encourage operators to coordinate which subsequently drives efficiency and innovation.

F. Implementation milestones

20. Implementation milestones are currently being discussed at the ITU in Working Party 4A. Kepler suggest that ISED align itself with those milestones once defined in the future. In the meantime, Kepler stands by its original suggestion of having both a soft and a hard limit for satellite deployment.

21. A section of the proposed milestones that Kepler strongly opposes is the notion of having at least 1 satellite in each orbital plane or losing the entire filing. Systems may be able to provide a better service by filling one plane at a time, rather than randomly attributing launches to varying planes for the sole purpose of meeting a regulatory milestone.

22. Generally speaking, Kepler supports SpaceX's notion that one-size-fits-all may not be appropriate to create a satisfactory regulatory regime¹⁸. Kepler's proposal in its initial comments aim to provide a framework that supports the development of constellations in a rollout/phased approach and as such differentiates based on size of the constellation.

23. Overall, Kepler does not believe that the elimination of a license is in the public interest. Rather, ISED should considering reducing the license to what has been deployed at the time a milestone is missed and making the in-service portion subject to non-protection and non-interference. Completely eliminating a license with satellites already in orbit has the potential to increase space junk if the

¹⁸ See SpaceX comments, *par 3 section F*

system does not operate elsewhere. Telesat appears to support this notion of reducing a system's license rather than eliminating it in their comments¹⁹.

G. Large NGSO Definition

24. CSSIF has noted that they are collectively of the belief that there should be no difference between NGSO systems as it would be *inconsistent with the principles of technological and competitive neutrality* and that it would lead to *regulatory gaming, especially if the conditions that apply to small constellations differ from those of large constellations*²⁰.
25. Generally speaking, Kepler does not believe that any substantiated arguments were given to support the above argument. Contrary to CSSIF, Kepler believes that simpler regulations for smaller constellations would lead to increased investment and development. The fundamental issue becomes where to draw the line between what is classified as a *smaller* constellation. A distinction exists between GEO, MEO and LEO as the nature of the systems are fundamentally different. Kepler believes that within LEO there can not be a single definition of a system. Simply put, there is too much diversity. A 1U cubesat being deployed at a 400 Km altitude from the ISS is unlikely to have the same implications on spectrum as larger systems at higher altitudes up to 2000 Km.
26. In support of the above, SpaceX has suggested that the use of criteria other than size may provide better means of defining large constellations²¹. The unfortunate aspect of this proposal is the relative difficulty in coming to an all-encompassing set of regulations vs simply defining a constellation size.
27. On balance, Kepler believes that differentiation between systems is required and that constellation size is the simplest way forward despite its obvious limitations. Furthermore, ISED should consider whether or not it will differentiate between the types of systems.

H. Coordination disputes

28. Mirrosat Systems Canada (MSCI) has proposed an intriguing method for band segmentation based on the apparent efficiency of a system. Where such a proposal potentially breaks down is in the definition of efficiency and service being provided. Under Section H – *Par 3*, System B may come in and be

¹⁹ See Telesat comments, *par 91*

²⁰ See CSSIF's comments, *par 45 and 46*

²¹ See SpaceX comments, *par 1 section G*

spectrally twice as efficient (ie bits/Hz) however, System B may be providing a store and forward service while System A may be providing a real-time bent pipe service. It is also worth noting that if efficiency is measured purely as data throughput vs Hz utilized – System B with a single large gateway may be more efficient than System A, which is servicing significantly more (yet smaller) ground stations.

29. With further development MSCI's proposal could become substantial. Given the state of the proposal and as discussed under subsection E, Kepler still believes that band segmentation is the simplest way forward that incentivises operators to coordinate on their own.

I. Foreign Licensed systems

30. Kepler is unclear with regards to Boeing's request for a "service provider" to seek approval to provide FSS/MSS services within Canada using a foreign NGSO system. Point 11 in their comments would allude to the acceptance of an NGSO that is potentially not licensed anywhere else but is granted access to Canada based on a domiciled holding company. What would the legal implications be and where would the line be drawn between working with the holding company and working with the NGSO operator, that may or may not be licensed elsewhere? Would coordination have to be undertaken with two separate holding companies in different countries if operations are to take place close to territorial borders?
31. It is not apparently clear from Boeing's comments under points 10, 11 and 12 why such a framework would be required for FSS. Unlike MSS, FSS is typically based on known locations – presumably ISED could streamline applications, but how failure to do so would result in a loss to the Canadian public is not inherently clear. If regulation prohibits foreign license holders from seeking ubiquitous coverage for FSS then it is likely beneficial to level the playing field between domestic and foreign systems.
32. Telesat has made an important comment with regards to the burden potentially imposed on Canadian systems while allowing foreign systems access with relative ease²². ISED should ensure that whatever method employed for granting foreign licenses, Canadian operators are not penalized for filing within Canada. Canadian licensed systems must be provided an equal playing field to those licensed abroad if the Canadian space industry is to compete globally.

²² See Telesat comments, *par 8*

33. Kepler disagrees with proposals that would eliminate the requirement for foreign systems to coordinate with Canadian systems – regardless of ITU filing date. Kepler points ISED to its comments under section E for further clarification. Mandated spectrum sharing would encourage operators to coordinate rather than attempt to hoard spectrum.
34. In summary; Kepler believes that foreign licensed systems should be provided an equal playing field but maintains that Canadian systems must not be disadvantaged by local regulations.

J. Revoked licenses

35. Kepler generally agrees with some other commenters that 30 days may be too short a time period to prepare a license application. In the interest of ensuring that operations of all sizes have sufficient time to allocate resources to the creation of an application, Kepler suggests an increase to 60 days would be an appropriate timeframe.

Other Items

Under *par* 4 of NorthStar’s comments, they note uncertainty surrounding the applicable fees for the licensing of a commercial NGSO. Kepler has been under the impression that the fees associated with a license would be those specified under section 3.2 *Licensing and Fee Regime (SMSE-006-13)*²³. Should this not be the case and ISED anticipates introducing additional costs, then Kepler fully supports the request for disclosure of such amendments prior to the lifting of this moratorium.

In paragraph 10 of Telesat comments they note that *it would be a mistake for ISED to develop new NGSO rules and policies premised on the assumption that multiple large new global NGSO systems will be successfully implemented*. While Kepler agrees that history shows the general failure of the majority of past filings to deliver on deploying large NGSO constellations – attention should be drawn to the changes in technology and the rampant increase in cubesats being deployed to replace systems previously deployed with fewer and larger satellites. In light of this, regardless of whether all currently proposed systems become operational or not, Kepler believes it is in ISED’s best interest to ensure that the regulations are fit for the current and future growth in NGSO systems.

²³ See *Decisions on the Licensing Framework for Fixed-Satellite Service (FSS) and Broadcasting-Satellite Service (BSS), Implications for Other Satellite Services in Canada, and Revised Fee Proposal* - Nov 5, 2013

ISED's attention was drawn to the notion that it should be rewarding specific architectures. Kepler, in line with the ISED's mandate to promote an *efficient and competitive marketplace* as highlighted by the CSSIF, believes that the promotion of novel technology to facilitate coordination is the only way to effectively reach such a mandate. Kepler agrees with the comment that any proposition for a regulator to reward specific satellite architectures would diverge from historic practice²⁴. That being said, ISED must realize the difference between promoting an architecture and promoting systems that facilitate an *efficient and competitive marketplace*. Externalities exist on fossil fuel power stations for the simple reason that if left purely to financially driven market forces, they would result in higher returns than opting for renewable energies. The same is true for passenger cars in Canada; positive financial externalities were introduced in order to promote the introduction and development of novel technologies within the automotive industry²⁵. In both instances, regulation has been imposed to promote advancements for the economic and general benefit to the Public of Canada without rewarding specific technology. ISED and all commenters in this process understand the intrinsic value and scarcity associated with spectrum and allocations – hence the extensive effort put into the comments by all parties. ISED and all other parties involved likely understand that NGSO operations, at the scale being discussed today, are a far cry from what has previously been envisioned. In order to encourage continued future development, ISED – as the regulator, must ensure that its policies promote the *efficient* use of spectrum and continue to promote a *competitive* landscape by incentivising technology that facilitates the ability to continuously introduce new systems. As noted within this document, ISED may also wish to provide incentives to systems that have the *capability* to provide 24/7 based coverage over Canada. It is also worth noting that several of the larger and more established players have chosen spot/steerable beam technology over wide-beam to support their bent-pipe network architectures²⁶. Telesat elaborates further and notes that *No Canadian gains any benefit from wasting otherwise usable system capacity by spreading the antenna footprint over territory where there is no user demand*²⁷.

For further emphasis, Kepler notes that despite the ability to steer its comments towards the promotion of a closed and monopolistic Canadian marketplace, it has chosen to promote openness and equality among both foreign and domestic operators. Kepler has done so despite the additional challenges and hurdles that such comments will impose on it as a new market entrant, and any suggestion that our comments may be

²⁴ See OneWeb comments, Summary – Par 6.

²⁵ Such technology spans from Hydrogen fuel cells, to hybrids and electric to name a few.

²⁶ See O3B comments, par 3 – See SpaceX comments, par 7 – See Telesat comments, par 51 – See Boeing FCC narrative (footnote 1 of Consultation comments)

²⁷ See Telesat comments, par 51



self-serving are deeply regrettable. It is not Kepler's intent to isolate any operator nor favour any specific technology – our comments are at all times geared towards securing an open and efficient use of space from both a physical and spectral standpoint.

This consultation is focused on promoting the future of space innovation and just as carbon emissions on earth have been curtailed by regulation promoting Renewable Energy, ISED should regulate to promote technology that enables the governing of electromagnetic emissions in space.

Conclusion

Kepler strongly believes that *Reusable* Spectrum in space should be at the forefront of ISED's policy making. There is no better way to drive operators to coordinate and share spectrum for reuse than band segmentation regardless of ITU filing date. In order to continue promoting investment in Canada, ISED must further ensure that it does not disadvantage local operators over its international counterparts. While the length of the moratorium has been a significant worry to Kepler, the comments have provided a rich and diverse set of talking points to move forward on, both within Canada and internationally at the ITU. Kepler once again applauds ISED for seeking comment and making the process open and public.

Respectfully submitted,

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