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KUIPER/IND/TRAI/1

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RE: Comments on the Consultation Paper on Terms and Conditions for the Assignment of Spectrum for Certain Satellite-Based Commercial Communication Services

Kuiper Systems LLC (**Kuiper**), a wholly owned subsidiary of Amazon.com Services LLC (together, **Amazon**), welcomes the opportunity to submit these comments on the Consultation Paper on Terms and Conditions for the Assignment of Spectrum for Certain Satellite-Based Commercial Communication Services (**Consultation Paper**).

On July 30, 2020, the U.S. Federal Communications Commission (**FCC**) issued an Order and Authorisation permitting Kuiper to deploy a constellation of Non-Geostationary Satellite Orbit (**NGSO**) Fixed-Satellite Service (**FSS**) satellites in low Earth orbit (**LEO**) (**Kuiper System**) using Ka-band frequencies.¹ On October 6, 2023, Amazon launched two (2) satellites into space as part of its Protoflight mission of tests to validate the Kuiper System design and network performance. Within 30 days of sending these satellites into space, we achieved a 100 percent success rate for our mission, validating key technologies that underpin the Kuiper network and moving the program another step closer toward our long-term vision of providing fast, affordable broadband to unserved and underserved communities around the world. These tests allowed us to optimize the architecture and design of our satellite constellation, and we have now begun mass satellite production ahead of a full-scale deployment of Project Kuiper in the months to come.

Project Kuiper's NGSO constellation will bring fast, affordable broadband to unserved and underserved communities around the world. Project Kuiper will provide ubiquitous, high-capacity, high-speed, low latency broadband services to residential customers, schools, businesses, and institutions around the world, and also communications to terrestrial mobile network operators, global enterprises, and government users, among others. Through Project Kuiper, Amazon will enable connectivity where it is lacking, thereby helping to close the digital divide and ensure reliable access to communications.

¹ Kuiper Systems LLC, Order and Authorisation, ICFS File No. SAT-LOA-20190704-00057 (rel. July 30, 2020) (FCC 20-102), available online at <https://docs.fcc.gov/public/attachments/FCC-20-102A1.pdf>; Erratum to Kuiper Systems LLC, Order and Authorisation, ICFS File No. SAT-LOA-20190704-00057 (rel. September 4, 2020) (FCC 20-102), available online at <https://docs.fcc.gov/public/attachments/DOC-366700A1.pdf>; Kuiper Systems LLC, Order and Authorization, IBFS File No. SAT-MOD-20211207-00186 (rel. February 8, 2023) (DA 23-114), available online at <https://docs.fcc.gov/public/attachments/DA-23-114A1.pdf>; Kuiper Systems LLC, Order and Authorization, ICFS File Nos. SAT-MOD-20230228-00043 & SAT-AMD-20230613-00140 (rel. March 8, 2024) (DA 24-224), available online at https://licensing.fcc.gov/myibfs/download.do?attachment_key=26928238; Kuiper Systems LLC, Order and Authorization, ICFS File Nos. SAT-MOD-20210806-00095 & SAT-AMD-20230329-00067 (rel. April 22, 2024) (DA 24-376), available online at https://licensing.fcc.gov/myibfs/download.do?attachment_key=27625490.

A. General Comments

Amazon respectfully recommends the TRAI adopt flexible spectrum assignment policies considering modern NGSO systems dynamic use of Ka-band frequencies (17.7-20.2 GHz (space-to-Earth) and 27.5-30 GHz (Earth-to-space)) for both gateway stations and customer terminals. Additionally, frequencies in the Q/V-bands (specifically, 37.5-42.5 GHz (space-to-Earth), 47.2-50.2 GHz (Earth-to-space), and 50.4-51.4 GHz (Earth-to-space)) are important expansion bands for NGSO systems. Satellite operators already use the Q/V-bands for FSS, and those bands will continue to be important for NGSO systems.

In addition, the TRAI should rely on the International Telecommunication Union's (ITU) proven coordination provisions and procedures for managing compatibility between NGSO systems and interference resolution. Amazon submits that there will not be geographic scarcity of gateway earth stations and, as such, there is no need for the TRAI to adopt default protections in the form of separation distances. The same holds true for sharing spectrum with terrestrial wireless services where spectral efficiency is maximized through coordination procedures to resolve harmful interference incidents, rather than default separation distances. We agree with the TRAI's recommended roll-out obligations, and respectfully submit that no additional obligations are necessary. Further, Amazon suggests the TRAI recommend reasonable processing timelines to provide transparency and regulatory certainty for applicants seeking to deliver innovative satellite services to people and business in India.

Amazon lauds the government on settling the assignment methodology of spectrum for satellite communication services/systems as administrative assignment through the Telecommunications Act 2023. We respectfully recommend that spectrum management fees be on a percentage of annual gross revenue. Specifically, we recommend the TRAI adopt a spectrum charge of less than one percent (1%) of annual gross revenue. This approach should be applied to all satellite-based communication services that are offered under a Unified License (UL). This approach is consistent with the TRAI's own recommendations, as unlike the requirement of exclusive spectrum for terrestrial wireless services, spectrum in the frequency bands used for satellite communications can be shared amongst multiple operators.

Further, Amazon respectfully submits that there is a need to recognise the fundamental difference between operations of terrestrial wireless and satellite communication services/systems, and enable efficient spectrum regulation. Additionally, the business model and the mature regulatory environment for terrestrial wireless operators are distinguishing factors from that of the novel NGSO satellite operators. Moreover, customers and businesses in India can be offered even lower cost satellite services when the spectrum chargers are correspondingly reduced. This approach would help achieve the goal of providing fast, affordable broadband to unserved and underserved communities.

B. Specific Comments

Q1. Which frequency band(s)/ range(s) should be considered for the assignment to NGSO based Fixed Satellite Services for providing data communication and Internet service? Please provide a detailed response separately for the user link and feeder link.

Generally, modern satellite systems can provide data communication and internet services in most of the frequency bands allocated to the FSS in Article 5 of the ITU Radio Regulations (ITU-RR). Specifically, the Kuiper System has a flexible payload design, and with the exception of the 18.6-18.8 GHz band, will use most of the 17.7-20.2 GHz frequency band for customer terminal downlink communications (space-to-Earth), and much of the 28.35-30 GHz frequency band for customer terminal uplink communications (Earth-to-space). The gateway stations will also use most of the 27.5-30 GHz frequency band for uplink communications (Earth-to-space), and of the 17.7-20.2 GHz frequency band -- again, with the exception of the 18.6-18.8 GHz band -- for downlink communications (space-to-Earth). Flexible satellite operations allow Amazon to meet varying system-wide demands and offer lower prices for its satellite services, to the benefit of customers and businesses in India. Accordingly, the TRAI should permit flexible spectrum assignments (i.e., for gateway stations and customer terminals) throughout the entirety of the Ka-band frequencies.

Additionally, as other frequency bands become congested, the spectrum in the Q/V-bands represent a critical opportunity for the expansion of NGSO systems. Satellite operators already use the Q/V-bands for FSS today, and those bands will continue to be important for NGSO systems. Amazon has sought authority from the FCC to access the Q/V-bands to expand the capacity of its network and allow it to provide faster and more reliable service to customers. Amazon plans to use most of the Q/V-bands (specifically, the 37.5-42.5 GHz (space-to Earth), and the 47.2-50.2 GHz and 50.4-51.4 GHz (Earth-to-space) frequency bands) for both gateway stations and customer terminals. Access to the Q/V-bands in India and elsewhere would allow Amazon to increase the available capacity of the first-generation Kuiper System, allowing Amazon to close the digital divide for even more customers and include these frequencies on its second-generation system, thereby increasing the reach and capabilities of the Kuiper System.

Q2. Which frequency band(s)/ range(s) should be considered for the assignment to GSO/ NGSO based Mobile Satellite Services for providing voice, text, data, and Internet service. Please provide a detailed response separately for the user link and feeder link.

Amazon has no additional comments to provide on this topic.

Q3. What should be the maximum period of assignment of spectrum for - (a) NGSO based Fixed Satellite Services for providing data communication and Internet services, and (b) GSO/ NGSO based Mobile Satellite Services for providing voice, text, data, and Internet services? Please provide a detailed response along with international practice in this regard.

Amazon respectfully recommends spectrum assignment be co-terminus with the license. Under this mechanism, the TRAI should establish a spectrum assignment period of 20 years or till expiry of the license, whichever is earlier. Doing so would allow greater regulatory certainty and facilitate timely deployment of satellite services, which require significant investment and many years of planning. The costs of deploying an operational satellite system — including the kind of system that can deliver high quality broadband connectivity to tens of millions of broadband customers and businesses across the globe — have been estimated to be in the billions.² This high level of upfront investment requires an equally high level of regulatory certainty as to which operators are subject to which regulations, and how those regulations are to be construed, implemented, and enforced. A spectrum assignment period of twenty (20) years would account for the investment required to provide satellite services and the time to implement and deploy a satellite network.

Q4. For assigning spectrum for NGSO-based communication services, whether every ITU filing should be treated as a separate satellite system? Please provide a detailed response along with international practice in this regard.

Amazon respectfully recommends that spectrum assignment to NGSO-based communications systems be done per IN-SPACe authorisation and not per ITU filing. Each ITU filing can serve a different purpose within the broader context of the NGSO constellation. For example, the Kuiper System will be comprised of three (3) different orbital shells at different altitudes and inclinations that are contained in three (3) separate ITU filings. Each shell is optimized to provide coverage and capacity and operate safely. However, the combination of the orbital shells is what makes the Kuiper System truly a global system, bringing reliable communications to the unserved and underserved communities in India and around of the world. Moreover, the spectrum assignment serves a different function than the ITU filings. The assignment of spectrum also addresses gateway stations and customer terminals. Additionally, the assignment of spectrum must provide business certainty by means of continuous availability of spectrum and licenses, whereas the ITU filings facilitate global coordination of the satellite system.

Q5. Whether the provisions of ITU-RR are sufficient to resolve interference related challenges and coordination issues? If not, what additional conditions should be prescribed while assigning frequency spectrum for – (a) NGSO based Fixed Satellite Services for providing data communication and Internet services; and (b) GSO/ NGSO

²See, Chris Daehnick et al., *Large LEO Satellite Constellations: Will it be Different This Time?*, McKinsey & Company (May 4, 2020), <https://bit.ly/3v20cnp>.

**based Mobile Satellite Services for providing voice, text, data, and Internet services?
Please provide a detailed response along with international practice in this regard.**

Amazon respectfully submits that the provisions of the ITU-RR successfully facilitate coordination and resolve interference issues. Even as the satellite industry rapidly innovates, the ITU evolves its provisions and procedures to keep pace with technology. World Radiocommunication Conferences refresh the consensus approach to international frequency coordination among satellites systems, and even the semiannual Working Party 4A meetings iterate (through consensus) the international standards for managing interference and building improved coordination methodologies for satellite systems to increase the efficient use of the orbit spectrum resource. Practically speaking, modern FSS systems employ frequency sharing techniques that can avoid harmful interference to other systems, such as automatic power control, frequency shifting, angular avoidance, and satellite or earth station diversity.

Indeed, the current ITU-RR provisions under Article 22 establishing equivalent power flux-density (EPFD) limits to avoid interference between GSO networks and NGSO systems, which were developed twenty-five (25) years ago based on outdated technical assumptions about NGSO systems, significantly over-protect GSO networks. This over-protection unjustifiably constrains the performance and efficiency of LEO systems and, as a result, restrict the ability of systems such as the Kuiper System to provide the most efficient and affordable broadband service to unserved and underserved communities. These existing provisions may be improved by revisiting the EPFD limits, and the TRAI may wish to consider an approach that ensures a fair balance is found between flexibility, including efficient service delivery, and the protection of other services. Updating these limits to take account of major developments in this sector over the past 25 years will enable LEO systems to manifest their full potential for communities around the world in the form of improved throughput and capacity. In addition, the spectral and infrastructure efficiencies flowing directly from reformed EPFD limits will align with and significantly promote national radiocommunications, telecommunications, productivity, and sustainability policy objectives.

Q6. For satellite earth station gateways of different satellite systems operating in the same frequency range, whether there is a need to prescribe a protection distance or any other measures to avoid interference from each other – (a) Between the gateways of GSO and NGSO systems; and (b) Between the gateways of NGSO systems? If yes, please provide a detailed response along with international practice in this regard.

Building on the response to Q5, above, Amazon's experience has been that no protection distances are necessary as a default mandatory procedure to ensure mutual operability for any combination of NGSO-GSO or NGSO-NGSO systems. NGSO and GSO gateway earth stations can coexist as long as mitigation measures such as avoidance angle and intelligent satellite selection are implemented, and all NGSO systems are capable of doing so. For NGSO-GSO systems, coordination procedures under Article 9 of the ITU-RR or EPFD limits under Article 22 of the ITU-RR ensure mutual compatibility between these systems. For NGSO-NGSO systems, the Article 9 coordination procedures provide a sufficient structure to facilitate the necessary dialog between operators so that they can establish the technical conditions, unique to their respective systems, to ensure mutual compatibility between the satellite systems and their associated earth stations—gateway stations and customer terminals. Amazon respectfully recommends that the TRAI rely on the ITU framework and international practice for any interference avoidance measures, and not prescribe any form of protection distance or default interference avoidance measures as this would lead to inefficient spectrum use and lower quality services being available to customers and businesses in India.

Q7. In case the spectrum assigned for satellite gateway links is also assigned to terrestrial networks such as Fixed Service, IMT etc., what protection distance or criterion should be included in the terms and conditions of the assignment of spectrum for satellite gateway links to avoid any interference to/ from terrestrial networks? Please provide a detailed response along with international practice in this regard.

As stated above, a default protection distance can lead to inefficient spectrum use. Amazon respectfully recommends that such policies be avoided, as alternatives exist that yield greater spectral efficiency. Applying the coordination provisions in the ITU-RR are sufficient for satellite gateway stations to anticipate the magnitude and behavior of interference from other systems. With predictable and

transparent spectrum assignment procedures for terrestrial networks and technical conditions following international standards, the interference magnitude and likelihood can be calculated for terrestrial and satellite gateway links. This, in turn, enables sharing spectrum without causing or receiving harmful interference.

Use of Ka-band frequencies in the 28 GHz band by mobile terrestrial systems around the world has been minimal considering the poor propagation qualities of these frequencies.³ With this in mind, Amazon respectfully suggests that the 28 GHz band be reserved for satellite gateway stations and customer terminals.

Q8. In case the spectrum assigned to the satellite user link is also assigned to terrestrial networks such as Fixed Service, what criterion should be included in the terms and conditions of the assignment of spectrum for satellite user links to avoid any interference to/ from terrestrial networks? Please provide a detailed response along with international practice in this regard.

Amazon respectfully recommends that the TRAI not adopt a default criterion or condition for the assignment of spectrum for satellite customer terminals. As per footnote 5.516B in Article 5 of the ITU-RR, the operation of customer terminals –referred to as High Density Fixed Satellite Services (HDFSS) - can operate in an uncoordinated manner without causing interference to terrestrial networks and without seeking protection. In practice, the stations in the Fixed Service (FS) and FSS customer terminals will likely not overlap in frequency, time, and geography due to varying capacity needs, transmission times, deployment scenarios, and frequency selection options available to each station. As such, the overall likelihood of harmful interference occurring at the same time in the same frequencies should be relatively low.

Q9. Whether there is a need to prescribe any conditions to mitigate the risk of scarcity of satellite gateway sites? If yes, please provide a detailed response along with international practice in this regard.

Amazon respectfully suggests that there is no need for default procedures or conditions to mitigate gateway station site scarcity. As mentioned above, NGSO and GSO earth stations can be collocated provided they coordinate their operations and follow international provisions in the ITU-RR for sharing spectrum.

Q10. In addition to the roll-out conditions recommended by TRAI for satellite-based Telecommunication Service Authorisation through its recommendations on the Framework for Service Authorisations to be Granted Under the Telecommunications Act, 2023 dated 18.09.2024, whether there is a need to impose certain additional roll-out obligations for the assignment of frequency spectrum for – (a) NGSO based Fixed Satellite Services for providing data communication and Internet services; (b) GSO/ NGSO based Mobile Satellite Services for providing voice, text, data, and Internet services? Please provide a detailed response along with international practice in this regard.

Amazon respectfully submits that there is no need to impose additional rollout obligations for spectrum assignments to either of these satellite services, over and above the rollout obligations as recommended by the TRAI in the consultation document for the satellite-based telecommunication service authorisation.

³ See, e.g., Georgia Sweeting, *South Korea Revokes Stage X's Mobile License*, Total Telecom (June 17, 2024), <https://totaltele.com/south-korea-revokes-stage-xs-mobile-license>; Sue Marek, *KT and LG Uplus Lose Their 28 GHz Spectrum Licenses*, FIERCE NETWORK (Nov. 21, 2022), <https://totaltele.com/south-korea-revokes-stage-xs-mobile-license/#:~:text=The%20company%20won%20spectrum%20in,requirements%20to%20run%20its%20business;https://www.fierce-network.com/5g/kt-and-lg-uplus-lose-their-28-ghz-spectrum-licenses>).

TRAI recommended rollout obligations as follows:

(5) For provision of Satellite-based Telecommunication Service, the Authorised Entity shall roll out the network within 12 months from the date of frequency assignment, unless otherwise stipulated in the terms and conditions of the assignment of spectrum.

(6) In case of GMPCS Service, the roll out of the network shall mean installation and commissioning of a Satellite Earth Station Gateway Switch. In case of VSAT-based FSS, the roll out of the network shall mean installation and commissioning of a Hub Station for star network configuration or at least two VSAT terminals in case of mesh network configuration. For this purpose, the Authorised Entity can make use of the Satellite Earth Station Gateway Switch/ Hub Station established by other eligible authorised entities.

Amazon supports this recommendation, and respectfully suggests that the definition of rollout of “network” in Clauses 5 and 6 should be defined as deployment of at least one (1) satellite gateway earth station and that the twelve (12) month rollout window should run from the date of the frequency assignment.

Q11. Whether there is a need to introduce a provision for surrender of frequency spectrum prior to the expiry of the period of validity of spectrum assigned for - (a) NGSO based Fixed Satellite Services for providing data communication and Internet services; (b) GSO/ NGSO based Mobile Satellite Services for providing voice, text, data, and Internet services? If yes, what should be the process, and associated terms and conditions such as minimum period of spectrum holding, notice period, surrender fee, etc.? Please provide a detailed response with justifications.

Amazon does not see a need to introduce a provision for surrender of frequency spectrum by FSS systems. As discussed below, spectrum assigned administratively to one FSS system does not preclude the use of this same spectrum by other FSS systems. Operations in spectrum assigned for FSS use are on a non-exclusive basis, such that the use (or lack of use) by one FSS system does not harm the use of the same spectrum by another FSS system. If the TRAI were to adopt a surrender provision, it should simply be a surrender of the administrative assignment for a specific system, and should not have onerous terms, conditions, or fees associated with the return of frequency spectrum that is issued in a shared manner to many other systems.

Q12. Whether there is a need to prescribe timelines for processing the applications for the assignment of frequency spectrum for- (a) NGSO based Fixed Satellite Services for providing data communication and Internet services; (b) GSO/ NGSO based Mobile Satellite Services for providing voice, text, data, and Internet services? Please provide a detailed response with justifications.

Amazon respectfully submits that there is a need to prescribe processing timelines for spectrum assignments related to satellite services. Mechanisms that streamline the administrative process, such as establishing set procedural timelines, identifying a single government agency that serves as the point of contact, and allowing a simplified form of licensing of customer terminals (encompassing all permits and licenses required from the time of import within India to eventual use by subscribers) to ensure that the spectrum assignment framework can run efficiently and affordably for both the government and applicants. Specifically, Amazon respectfully suggests that the spectrum assignment application be processed within 30 days from the issuance of the in-principle clearance of network by the Department of Telecommunications (DoT).

Q13. Whether there are any other suggestions related to assignment of spectrum for- (a) NGSO based Fixed Satellite Services for providing data communication and Internet services; (b) GSO/ NGSO based Mobile Satellite Services for providing voice, text, data, and Internet services? Please provide a detailed response with justifications.

Amazon respectfully suggests that the process for assignment of spectrum should be simplified to enhance ease of doing business. Currently, the spectrum is assigned on a carrier-by-carrier basis. Any changes in the size of the carrier or increase/decrease in the number of carriers may necessitate

changes to the assignment, which is time consuming and results in additional cost and administrative burden. Spectrum should be assigned as a block, rather than on a carrier-by-carrier basis.

Q14. Should spectrum charges for NGSO-based FSS providing data communication and Internet services, be levied: (i.) On a per MHz basis, (ii.) On a percentage of Adjusted Gross Revenue (AGR) basis, or (iii.) Through some other methodology? Please provide a detailed justification for your answer.

Amazon respectfully submits that the spectrum charges for NGSO-based FSS systems should be levied on a percentage (%) of AGR, for simplification and as part of ease of doing business. This would ensure that the pricing structure for spectrum charges is transparent and justifiable, leading to a more equitable distribution of expenses and an incentive to use spectrum efficiently. This would also facilitate expansion of services, as affordable charges to end users would increase the scale of the services, and better utilize the available satellite capacity.

Additionally, Amazon encourages the TRAI to determine the amount of the charge using an administrative cost-based charging approach. Scarcity is unlikely when spectrum for satellite service can be shared by different operators/systems, negating potential opportunity cost of underutilized spectrum. Further, frequency coordination is also able to resolve potential conflicts in access and use of spectrum by different operators of satellite communication services/systems. Therefore, the overall spectrum charges do not need to be any higher than the administrative costs required to cover the allocation of spectrum. It will also facilitate investment and innovation in the burgeoning satellite communication industry by ensuring cost predictability.

This approach is consistent with the TRAI's own recommendations. The TRAI has previously recommended that spectrum charges for commercial VSAT CUG and GMPCS be 1% of AGR. For commercial VSAT CUG, this would entail reducing the charges from 4% to 1% of AGR, whereas for GMPCS services, this would entail a change in the charging mechanism itself. This was recommended on the rationale that this fee would adequately cover the administrative expenses incurred for managing the spectrum, thus emphasizing cost recovery as a basis for charging for spectrum for satellite-based services.⁴ Indian customers and businesses can be offered even lower cost satellite services when the spectrum charges are correspondingly reduced to below 1% of AGR. This would help achieve the goal to provide fast, affordable broadband to unserved and underserved communities. The TRAI has also reiterated the reduction of charges and the model on several occasions.⁵

The concern identified in Section 4.21 of the Consultation Paper appears to be a vestige from spectrum that is awarded on an exclusive basis for terrestrial wireless operators/systems. Administrative assignment of shared spectrum like NGSO-based FSS systems is not exclusive and, therefore, does not preclude the same spectrum for administrative assignment to other satellite-based communication services/systems. As such, the stated concerns that spectrum is "kept" or "hoarded" would not materialize in shared spectrum that is administratively assigned.

Amazon respectfully submits that the above is an example of the need to recognise the fundamental difference between operations of the terrestrial wireless and satellite communication providers/systems, and enable efficient spectrum regulation.

- Unlike spectrum for terrestrial wireless services/systems, spectrum used by satellite communications can be shared amongst multiple operators/systems. While terrestrial wireless providers/systems require exclusive access to spectrum to be able to rollout their services/systems effectively and optimize their network capacity, such exclusive rights to use the spectrum for satellite operators are not needed and would be an inefficient use of the finite spectrum resource.

⁴ TRAI, *Recommendations on Spectrum Usage Charges, and Presumptive Adjusted Gross Revenue for Internet Service Providers and Commercial Very Small Aperture Terminal Service Providers* (March 7, 2017), available at https://www.trai.gov.in/sites/default/files/Recommendations_07032017.pdf.

⁵ TRAI, *Recommendations on Licensing Framework for Satellite-based connectivity for Low Bit Rate Applications* (August 26, 2021), available at https://www.trai.gov.in/sites/default/files/Recommendations_26082021.pdf.

- The business model of terrestrial wireless operators/systems is distinct from satellite communication providers. Terrestrial service providers (TSP) secure their spectrum through auctions and, if successful, are awarded a license for a specific geographic area with a known population. The people and businesses in their license area represent their customer opportunity base. The TSPs then build their base stations and supporting network infrastructure to deliver wireless communications to customers and businesses in their license area who subscribe to the TSPs' services. If demand exceeds capacity, TSPs can build more base stations and infrastructure to meet that demand. On the other hand, satellite communication providers register and coordinate their frequencies at the ITU and share these frequencies with all other satellite systems registered at the ITU. To operate in a country, satellite communication providers seek authority from the responsible national authority to offer satellite communication services in the country. If successful, satellite operators obtain approval to operate in the country, using shared spectrum resources. The satellite operator builds and launches their satellites, builds their gateway stations and customer terminals, and begins offering services around the world. Satellite systems have limited capacity relative to their field of view. If demand exceeds capacity in a geography, the satellite operator cannot scale a constellation in the same manner as terrestrial wireless operators can with their network. A satellite operator would need to launch more satellites and possibly build more gateway stations, and that requires a cost benefit analysis to determine if the cost of the additional capacity would yield positive benefits.

Considering the above, a more economically sensible approach is necessary when determining terms, conditions, and spectrum pricing methods. This will ensure that the satellite-based communication services/systems are given an opportunity to grow to their fullest potential and maximize benefits to customers and businesses in India.

Q15. In case it is decided that spectrum charges for NGSO-based FSS providing data communication and Internet services should be levied on a per MHz basis, should these charges be calculated based on: (i.) The Department of Telecommunications (DoT) order dated December 11, 2023, or (ii.) An alternative approach (please specify)? Please provide a detailed justification to support your answer.

Amazon respectfully reiterates that the calculation of spectrum charges for NGSO-based satellite communication services/systems should be levied on a percentage of AGR basis, and should not be levied on a per MHz basis.

Q16. If it is decided that spectrum charges for NGSO-based FSS providing data communication and Internet services should be levied on a percentage of AGR basis: (i.) What should be the appropriate percentage of AGR? (ii.) Should a minimum spectrum charge be specified to address the issue of inefficient utilization of spectrum? If yes, what methodology may be used to determine the amount of the minimum spectrum charge? (iii.) Is there an alternative approach that could be followed to address the issue of inefficient spectrum utilization? Please provide a detailed justification for your answers.

Regarding (i), please refer to our response to Q14, above.

Regarding (ii) and (iii), Amazon submits that at this stage there is no need to specify a minimum spectrum charge to address the issue of inefficient utilization of spectrum. There is no reason to suspect that NGSO operators will not be effectively utilize spectrum or keep spectrum idle. Moreover, it is difficult and complex to measure spectral efficiency for NGSO FSS systems when considering their global operations, supporting varying customer needs, and dynamically optimizing available resources to meet system-wide traffic demands. Additionally, as mentioned above, NGSO-based FSS systems operate non-exclusively in shared spectrum, so it can be reused by multiple systems over the same geography.

Q17. Considering the Adjusted Gross Revenue (AGR) based charging methodology currently followed for Commercial VSAT and in view of the enhanced scope of the Satellite service authorisation, what should be the spectrum charge, as a percentage of AGR, that should be levied on GSO-based FSS? Or, Should some alternative spectrum charging methodology be used for determining spectrum charges for GSO-based FSS? Please provide a detailed justification for your answer.

AND

- Q18. Should spectrum charges for GSO and NGSO-based MSS that provide voice, text, data, and Internet services be levied: (i.) On a per MHz basis, (ii.) On a percentage of AGR basis, or (iii.) Through some other methodology? Please provide a detailed justification for your answer.**

AND

- Q19. If it is determined that spectrum charges for GSO/NGSO-based MSS providing voice, text, data, and Internet services should be levied on a per MHz basis, should these charges be calculated based on: (i.) The Department of Telecommunications (DoT) order dated December 11, 2023, or (ii.) An alternative approach (please specify)? Please provide a detailed justification to support your answer.**

AND

- Q20. If it is decided that spectrum charges for GSO/NGSO-based MSS providing voice, text, data, and Internet services should be levied on a percentage of AGR basis: (i.) What should be the appropriate percentage? (ii.) Should a minimum spectrum charge be specified to address the issue of inefficient utilization of spectrum? If yes, what methodology may be used to determine the amount of the minimum spectrum charge? (iii.) Is there an alternative approach that could be followed to address the issue of inefficient spectrum utilization? Please provide a detailed justification for your answers.**

Amazon respectfully submits the charging mechanism needs to be unified across the satellite-based service authorisations under the UL. This will allow for an efficient sharing of spectrum across these service authorisations under the UL.

On the preferred charging model, as stated above, Amazon supports spectrum charges for satellite communication service authorisations levied at a percentage basis of AGR, instead of on a per MHz basis. Please see the detailed response in Q.14, 15 and 16, above.

- Q21. Whether there are any other issues/suggestions relevant to the spectrum charging for: (i.) NGSO/GSO based FSS providing data communication and Internet services. (ii.) NGSO/GSO based MSS providing voice, text, data, and Internet services. The response may be submitted with proper explanation and justification.**

Amazon does not have any further issues/suggestions relevant to spectrum charging.