Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of The Establishment of Policies and Service Rules for the Non-Geostationary Satellite Orbit, Fixed Satellite Service in the Ku-Band	IB Docket No. 01-96

COMMENTS OF THE BOEING COMPANY

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SUMMARY

Boeing supports the spectrum-sharing plan set forth in Option Three of the *NPRM* – Avoidance of In-Line Interference Events – as its preferred option for intra-service NGSO FSS sharing. This option offers the most flexible and efficient method of spectrum sharing among the vast majority of NGSO FSS applicants.

In the event, however, that the Commission declines to adopt Option Three, Boeing proposes an alternative hybrid spectrum-sharing plan for NGSO FSS licensees. This alternative plan combines elements of each of the four spectrum sharing options proposed in the *NPRM* and is consistent with the Commission's objectives of ensuring equal access to spectrum resources, preventing spectrum warehousing, and promoting the cooperative sharing of spectrum assignments among NGSO FSS systems. Boeing's alternative plan also leaves the determination of where the various applicants will operate within the allocated spectrum to the service market, rather than to regulatory decision. As a result, Boeing's plan provides flexibility and technological neutrality, while at the same time achieving the principal objectives of the Commission and the various NGSO FSS applicants in this proceeding. Proposed final rules incorporating Boeing's alternative hybrid plan are provided as Appendix A of these comments.

In addition to its comments on intra-service sharing plans, Boeing provides the following comments:

- Hughes' double application for a single NGSO FSS system is inconsistent with Commission objectives of equitable access to spectrum resources and effective spectrum sharing. In order for any intra-service sharing plan to be effective and equitable, the two Hughes applications should be considered as part of a single NGSO FSS system and made to comply with aggregate interference limits. Once Hughes' applications are properly treated as a single system, any band segmentation plan adopted by the Commission should be based on six NGSO FSS systems, not seven.

- Boeing reiterates its position that it is patently unnecessary to determine compliance with

aggregate $EPFD_{down}$ limits, at least for the first three operational NGSO FSS systems, since by definition the first three operational systems cannot exceed aggregate limits. In any event, the Commission is correct to defer mandating an aggregate limit demonstration until the international satellite community has completed work on a methodology for making such a demonstration.

- Strict financial qualification rules are necessary to avoid mutual exclusivity, to assess the number of systems likely to be operational, and to estimate the probable amount of spectrum available to each licensee. In order to allow licensees time to raise capital, Boeing proposes that financial qualifications need only be demonstrated at the one-year milestone, when a licensee enters into a non-contingent satellite-manufacturing contract. This one-year time frame gives a licensee ample time to raise necessary capital.

- Boeing strongly supports the use of blanket licensing for user earth station terminals in order to facilitate the widespread commercial rollout of NGSO FSS services.

- Boeing also generally endorses the service rules proposed in the *NPRM* – specifically those rules relating to coverage requirements, implementation milestones, international coordination, reporting requirements, license term, regulatory classification, orbital debris mitigation, and the sale of licenses.

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COMMENTS OF THE BOEING COMPANY

The Boeing Company ("Boeing"), by its attorneys and pursuant to Section 1.415 of the Commission's Rules, 47 C.F.R. § 1.415 (2000), hereby provides comments on the policies and service rules proposed for the non-geostationary satellite orbit, fixed satellite service ("NGSO FSS") in the Ku-band, as requested by the recent Notice of Proposed Rulemaking in this docket.[1]

I. BOEING SUPPORTS THE SHARING PLAN SET FORTH IN OPTION THREE OF THE *NPRM*: AVOIDANCE OF IN-LINE INTERFERENCE EVENTS

As part of the *NPRM*, the Commission outlines four possible options for intra-service spectrum sharing among NGSO FSS licensees.[2] Each of these four options – Flexible Band Segmentation, Dynamic Band Segmentation, Avoidance of In-line Interference Events, and Homogeneous Constellations – employs various methods and procedures for allocating spectrum among the NGSO FSS applicants. Of these four options, Boeing supports the adoption of Option

[1] Establishment of Policies and Service Rules for the Non-Geostationary Satellite Orbit, Fixed Satellite Service in the Ku-Band, IB Docket No. 01-96, Notice of Proposed Rulemaking, FCC 01-134 (May 3, 2001) ("*NPRM*").

[2] *See id.* at ¶¶ 23-44.

Three (Avoidance of In-Line Interference Events) because it offers the most flexible and efficient method of spectrum sharing among the vast majority of NGSO FSS applicants.

As noted in the *NPRM*, a distinctive characteristic of the proposed NGSO FSS systems is the directivity of the satellite and earth station antennas they deploy.[3] The majority of NGSO FSS applicants – including Boeing – are able to utilize this directivity to share the same spectrum frequency and coverage by avoiding near in-line interference through the use of satellite diversity.[4] As a result, whenever in-line interference events are not a threat, NGSO FSS systems can share the entire spectrum allocated to NGSO FSS systems. Whenever in-line events do occur, the majority of NGSO FSS operators are able to avoid interference into one another's systems through the use of satellite diversity. Only if NGSO FSS operators cannot resolve in-line interference through the use of satellite diversity would it become necessary to make use of frequency isolation techniques that segment the available spectrum.

Boeing agrees that there must be an unambiguous technical definition for in-line interference in order to adopt Option Three.[5] Boeing supports the threshold for in-line interference that is suggested in the *NPRM*; that is, a licensee must take action to avoid interference when the inter-network interference caused by the earth and space station emissions of any one other network operating in the same frequency band or bands that is greater that six percent of the total system noise power under clear-sky conditions.[6]

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[3] *See id.* at ¶ 28.

[4] Satellite diversity requires a NGSO FSS system to avoid in-line interference by selecting another visible satellite within its system constellation whenever the current satellite approaches an in-line event with a satellite operating in another NGSO FSS system constellation. *See id.* at ¶ 30.

[5] *See id.* at ¶ 33.

[6] *See id*. (citing ITU-R, Recommendation S.735-1).

II. IN THE EVENT THE COMMISSION DOES NOT ADOPT OPTION THREE, BOEING PROPOSES A HYBRID SPECTRUM SHARING PLAN THAT COMBINES VARIOUS ELEMENTS OF THE FOUR PLANS PROPOSED IN THE *NPRM*

Although Boeing supports the adoption of Option Three as its preferred spectrum-sharing plan for NGSO FSS systems, it also proposes for consideration an alternative hybrid plan in the event that the Commission declines to adopt the avoidance of in-line interference events solution of Option Three. Although the Commission proposed the four options as a starting point for comments,[7] it has expressly reserved the option of adopting an alternative or hybrid band sharing arrangement.[8] Boeing urges the Commission to adopt such a hybrid solution in the event that the Commission determines that the avoidance of in-line interference events does not optimally suit the needs of all NGSO FSS applicants. In the event that the Commission does adopt Boeing's hybrid alternative plan, proposed final rules for the plan are provided as Appendix A of these comments.

A. Primary Spectrum Use

Boeing's proposed hybrid plan is based on the same use of sub-bands as all four of the Commission's proposed options. In order that all applicants have equal access to spectrum in each of the designated portions of NGSO FSS spectrum, the *NPRM* identifies three distinct sub-bands in the NGSO FSS uplink allocation (12.75-13.25 GHz, 13.75-14.0 GHz, and 14.0-14.5 GHz) and three sub-bands in the downlink allocation (10.7-11.7 GHz, 11.7-12.2 GHz, and 12.2-

[7] *See id.* at ¶ 3.

[8] *See id*. at ¶ 21 ("[W]e reserve the option of adopting an alternative engineering solution or band sharing arrangement that might include a hybrid solution arising from the options [set forth in the *NPRM*] . . . .").

12.7 GHz).[9] The *NPRM* states that, at a minimum, all NGSO FSS licensees need to have access to some spectrum in each of these six sub-bands in order to implement their systems.[10] Boeing concurs with this analysis and supports the Commission's use of sub-bands as a way to ensure that all licensees have equal access to allocated spectrum necessary to make their systems operational.

Under Boeing's hybrid sharing plan, every NGSO FSS applicant is allocated "primary" spectrum resources in each of the NGSO FSS sub-bands as soon as its system becomes operational.[11] Each NGSO FSS spectrum sub-band is divided equally by the number of operational systems in a manner similar to the Commission's Dynamic Band Segmentation option. Every time a new system becomes operational, the spectrum is divided equally among the total number of operational systems, and other operational systems must surrender spectrum to accommodate the new entrant. Accordingly, the first operational system would have access to all available spectrum in each NGSO FSS sub-band as its "primary" spectrum assignment.

As multiple NGSO FSS systems become operational, existing systems must surrender spectrum, and primary spectrum assignments are selected on a "first to operate" basis. For

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[9] *See NPRM* at ¶ 17. As noted in the *NPRM*, the frequencies within the NGSO FSS spectrum allocation are not fungible and not all NGSO FSS operations can take place in all frequencies of the allocated spectrum. *See id.* For example, the 10.7-11.7 GHz, 12.75-13.25 GHz, and the 13.75-14.0 GHz bands are shared with geostationary orbit fixed satellite service ("GSO FSS") and terrestrial services. For this reason, NGSO FSS in these bands is limited to the operation of gateway stations. *See id.* n.32. NGSO FSS service uplinks are limited to the 14.0-14.5 GHz band. Although service downlinks are possible in either the 11.7-12.2 GHz band or the 12.2-12.7 GHz bands, both these bands are shared with other services. *See id.*

[10] *See id.* at ¶ 17.

[11] Boeing proposes that "operational" have the same meaning as proposed in the *NPRM*: A system is operational when the first satellite in a system reaches its intended orbit and initiates transmission and reception. *See id.* at ¶ 26.

example, when two NGSO FSS systems become operational, each sub-band is divided in half. The first system to become operational has the right to select first which half of each sub-band to operate on a primary basis. The second operational system then operates on a primary basis on the remaining half of each sub-band. If three systems become operational, each sub-band is divided into three equal parts, and the first operational system again has first pick of which third of each sub-band to operate on a primary basis. The second operational system then selects a third of the remaining spectrum in each sub-band for its primary use, and the remaining third of the spectrum would go to the third system. This selection process is repeated each time a new NGSO FSS system becomes operational. Each system must notify the Commission of its specific selected primary spectrum assignments, as proposed in the *NPRM*.

As indicated above, each NGSO FSS system operates in its selected spectrum assignments on a primary basis as regards to all other operational NGSO FSS systems. As is the case for all primary systems, a NGSO FSS system operating within its selected spectrum assignments enjoys priority status for operations in those bands in relation to other operational NGSO FSS systems.

B. Secondary Spectrum Use

Unlike the Dynamic Band Segmentation option, Boeing's alternative hybrid plan specifically permits licensees to operate outside of their selected spectrum assignments on a secondary basis, so long as they do not cause harmful interference to other NGSO FSS licensees. As such, Boeing's proposal borrows from the Flexible Band Plan set forth in the *NPRM*. A licensee operating outside of its selected spectrum assignments must take action – together with other licensees also operating outside of their selected spectrum assignments – to prevent harmful interference to a NGSO FSS licensee that has primary status within the affected

spectrum. All licensees operating outside of their selected spectrum assignments must share equally the duty to avoid harmful interference to each other, regardless of which system was first to become operational.

As noted previously in these comments, Boeing agrees that there must be an unambiguous technical definition for harmful interference in order to accommodate secondary spectrum use.[12] Boeing recommends adopting the same trigger for harmful interference as that proposed in the *NPRM*'s Avoidance of In-Line Interference option; that is, a licensee must take action to avoid interference when interference caused by the earth and space station emissions of any one other network operating in the same frequency band or bands that is greater that six percent of the total system noise power under clear-sky conditions.[13]

NGSO FSS systems operating outside of their primary spectrum assignments can use numerous techniques to avoid causing harmful interference into primary systems, including the use of satellite or earth station diversity in order to avoid in-line interference events, the use of frequency diversity to avoid using another system's primary spectrum during an in-line event, or through the pooling of spectrum blocks among homogeneous systems. Additionally, systems operating outside their primary spectrum assignments can use alternative protection criteria other than the six percent noise power standard, if the primary spectrum user agrees to such an alternative approach as part of a coordinated agreement.

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[12] *See supra*, Part I.

[13] *See NPRM* at ¶ 33.

C. Spectrum Pooling Options

Boeing's alternative hybrid plan permits NGSO FSS licensees to "pool" spectrum blocks among homogeneous satellite systems to minimize interference potential. In this respect, Boeing's hybrid system incorporates many of the elements of the *NPRM*'s proposed Homogeneous Constellations option.[14] Under Boeing's hybrid plan, NGSO FSS licensees are able to pool spectrum resources with systems using similar or identical orbital parameters and system designs in order to maximize coordination potential between their systems. For example, a newly operational NGSO FSS system would be able to pool its spectrum assignment with an already operational system and enter into an agreement whereby the two systems could pool spectrum resources into a single, homogeneous assignment.[15]

Unlike the Homogeneous Constellation option set forth in the *NPRM*, however, Boeing's hybrid plan does not make an *a priori* division of spectrum resources among potential constellation designs (which may or may not become operational), nor does it require the Commission or licensees to adopt any particular constellation design.[16] Instead, licensees are free to select their system designs as they see fit, and spectrum resources are apportioned according to market conditions when systems become operational.[17] Furthermore, Boeing's plan

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[14] *See id.* at ¶¶ 37-44.

[15] If necessary, steps may be required to ensure that two systems that pool their spectrum assignments are assigned adjacent spectrum blocks – if the use of adjacent spectrum assignments facilitates their homogenous operations.

[16] *See NPRM* at ¶ 37.

[17] If certain spectrum is considered less desirable by certain constellation designs because of the need to share with GSO BSS (Broadcast Satellite Service) or the proposed MVDDS (Multichannel Video Distribution and Data Service), then the desire to obtain more favourable spectrum blocks is a powerful incentive for a licensee to make its system operational as soon as possible.

would not restrict the amount of spectrum available to licensees that chose to use a different constellation design than that mandated by the Commission.[18] For example, if two out of three operational systems decide to pool their spectrum for homogenous operations, then two-thirds of the total spectrum would be dedicated to a homogenous approach.

A decision by two or more operators to pool their spectrum would not diminish the rights of non-homogenous systems to operate in the pooled spectrum on a secondary basis. Furthermore, all systems operating outside their primary spectrum assignments would be required to share the burden of spectrum sharing between secondary systems, even though one or more of the systems may be operating outside of its primary spectrum assignments pursuant to a homogenous pooling assignment.

D. Aggregation Issues

As with each of the spectrum sharing options proposed by the Commission, Boeing's alternative hybrid plan obviates the need for aggregate interference demonstrations for the first three NGSO FSS systems that become operational. Because the single-entry validation limits are derived from the aggregate validation limit divided by a factor of 3.5, it is impossible as a matter of definition for the first three operational NGSO FSS systems to exceed the aggregate limits. This rationale holds true even if all three operational systems operate throughout the entire sub-bands on either a primary or secondary basis.

[18] As a variation on the homogenous constellation option, the *NPRM* proposes to mandate only one homogenous constellation design in one portion of the available NGSO FSS spectrum. NGSO FSS licensees who chose not to use that design are allowed to share the remaining portion of the NGSO FSS spectrum through alternative spectrum-sharing proposals, but are assumedly prohibited from any operations in the homogenous spectrum assignments. *See NPRM* at ¶ 39.

Aggregate interference demonstrations are required only when the fourth NGSO FSS system becomes operational. When the fourth system is launched, the fourth licensee must demonstrate that it can meet the aggregate interference limits before it can operate on a secondary basis in any other spectrum sub-bands. Under Boeing's hybrid approach, however, the fourth system does not need to demonstrate compliance with the aggregate interference limits in its selected spectrum assignment where it operates on a primary basis. Instead, once the fourth system is launched, the third system that became operational will need to demonstrate compliance if it seeks to operate on a secondary basis in the fourth system's primary spectrum assignment. Similarly, when a fifth system becomes operational, it will not have to demonstrate compliance in its primary spectrum assignment. Rather, the third and fourth operational systems will need to demonstrate compliance before being able to operate on a secondary basis in the fifth system's primary spectrum assignment. The fifth system will need to demonstrate compliance with aggregate limits before it can operate on a secondary basis in any other spectrum bands. This pattern of compliance demonstration continues for the remaining NGSO FSS systems that become operational.

E. Public Interest Benefits

Boeing's alternative hybrid plan is fully consistent with the objectives set forth by the Commission and NGSO FSS applicants. The Commission noted three principal objectives of any spectrum sharing options. First, the Commission seeks to ensure that all applicants have equal access to spectrum. Boeing's hybrid plan achieves this objective by adopting the Commission's sub-band approach as its foundation, so that each applicant has access to spectrum in each of the sub-bands. Furthermore, by avoiding *a priori* division of spectrum among different various constellation designs, Boeing's plan avoids potentially asymmetrical spectrum

divisions, whereby a system using a particular constellation design could be allocated more than its proportionate share of spectrum resources – without even becoming operational.[19]

Second, the Commission seeks to prevent spectrum warehousing by non-implemented NGSO FSS systems at the expense of operational systems.[20] Boeing's hybrid plan achieves this objective by allocating spectrum resources to a NGSO FSS licensee only upon the licensee's system becoming operational. Until the system becomes operational, the licensee has no spectrum to warehouse and cannot interfere with the use valuable spectrum resources by other operational NGSO FSS licensees. Due to the fact that spectrum resources are assigned on a "first to operate" basis, NGSO FSS licensees have additional incentive to make their systems operational as soon as possible.

Third, the Commission recognizes the limited availability of NGSO FSS spectrum and the need of NGSO FSS licensees to share cooperatively their respective spectrum assignments.[21] Boeing's hybrid plan encourages licensees to coordinate the use of their spectrum assignments, such as through pooling of spectrum resources to create spectrum blocks for homogeneous systems. Furthermore, Boeing's hybrid plan is consistent with the Commission's stated belief

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[19] The band sharing plan proposed by Virtual Geo could lead to this incongruous result. Under this proposed plan, slightly less than half of all NGSO FSS spectrum in each sub-band would be allocated to its proposed HEO constellation design, without any regard to whether or not such a system becomes operational and even though HEO applicants constitute significantly less than half the number of total NGSO FSS applicants. *See NPRM* at ¶ 44. Indeed, the Commission notes that Virtual Geo claims to have a patent that could make it difficult or impossible for *any* other NGSO FSS applicant to use a HEO constellation design. *See id.* Under Boeing's hybrid plan, it is entirely possible that HEO-based systems could still occupy half (or even all) of the allocated NGSO FSS spectrum in a homogeneous block. This possibility, however, is based on HEO systems actually becoming operational – not on pre-emptive regulatory fiat.

[20] *See NPRM* at ¶ 18.

[21] *See id.* at ¶ 19.

that the marketplace should decide the most effective implementation of NGSO FSS systems,[22] including the allocation of spectrum resources and the choice of constellation design.

III. HUGHES' IMPROPER DOUBLE APPLICATION IS INCONSISTENT WITH THE COMMISSION'S OBJECTIVES OF EQUITABLE ACCESS TO SPECTRUM RESOURCES AND EFFECTICE SPECTRUM SHARING

The *NPRM* states that there are seven applications pending for different NGSO FSS systems requesting access to spectrum resources in the Ku-band and proposes in its Flexible Band Segmentation Plan to divide each of the NGSO FSS sub-bands by seven applicants.[23] In reaching this number of applicants, the Commission apparently counts each of Hughes' two applications as a separate system, each entitled to its own share of spectrum resources.[24] This treatment is unjustified, given that even Hughes itself has acknowledged that its HughesLINK and HughesNET applications constitute a single system.[25] As a result of this splitting of its system into two applications, Hughes claims a double share of scarce spectrum resources and circumvents the aggregate interference limits in violation of rules and policies established by the FCC and the ITU.[26]

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[22] *See NPRM* at ¶ 16 ("It is our firm belief that the marketplace should decide the most effective implementation of the NGSO FSS systems.").

[23] *See id.* at ¶¶ 16, 23.

[24] *See id.*, Appendix D (listing Hughes' applications as separate systems).

[25] *See Application of Hughes Communications Inc. for the HughesLINK System*, SAT-LOA-19990108-00002 S2362, at 5 (Jan. 8, 1999) (stating that "[t]he MEO H-LINK system is one part of a two-part NGSO constellation that Hughes has designed…").

[26] *See, e.g.,* Resolution 135 (WRC-2000): Criteria and process for the resolution of possible cases of misapplication of non-GSO FSS single-entry limits in Article S22 (resolving that "misapplication of the single-entry limits in Article S22, either by artificial splitting or combining of non-GSO systems, shall not be permitted").

In order for any intra-service sharing plan to be effective and equitable, the two Hughes applications should be considered as part of a single NGSO FSS system and made to comply with aggregate interference limits. Once Hughes' applications are properly treated as a single system, any band segmentation plan adopted by the Commission should be based on six NGSO FSS systems, not seven.[27]

IV. THE COMMISSION IS CORRECT TO DEFER DEMONSTRATION OF AGGREGATE LIMITS REQUIREMENTS

Boeing continues to note that a demonstration of compliance with aggregate limits is patently unnecessary for the first three operational NGSO FSS systems. Because the single-entry $EPFD_{down}$ validation limits are derived from the aggregate validation $EPFD_{down}$ limits that assume 3.5 operational NGSO FSS systems, the first three NGSO FSS systems cannot by definition exceed the aggregate $EPFD_{down}$ limit. As the Commission itself has noted, a good deal of time will pass before more than three NGSO FSS systems are operating.[28] This fact by itself diminishes the urgency for any demonstration of compliance with aggregate $EPFD_{down}$ limits.

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[27] Additionally, the Commission must acknowledge that Boeing filed a second application by the cut-off deadline for this proceeding seeking to operate feeder links in the Ku-band for its 2 GHz MSS satellite network. *See Application for Authority to Launch and Operate a Non-Geosynchronous Medium Earth Orbit Satellite System in the 2 GHz Band Mobile-Satellite Service and in the Aeronautical Radionavigation-Satellite Service*, The Boeing Company, File No. SAT-AMD-19980318-2001 (filed Mar. 18, 1999). Boeing subsequently filed an amendment to its 2 GHz MSS application seeking alternatively to operate its feeder links in the Ka-band. *See Application for Authority to Launch and Operate a Non-Geosynchronous Medium Earth Orbit Satellite System in the 2 GHz Band Mobile-Satellite Service and in the Aeronautical Radionavigation-Satellite Service*, The Boeing Company, File No. SAT-AMD-20001103-00159 (filed Nov. 3, 2000). Although Boeing has sought to amend its application, Boeing's original request for Ku-band feeder links must remain under consideration by the Commission until Boeing's November 3, 2000 amendment is formally granted.

[28] *See NPRM* at ¶ 61.

Furthermore, Boeing's alternative hybrid plan already provides a detailed regime for addressing demonstrations of compliance with the aggregate validation limits.

In any event, Boeing supports the *NPRM*'s conclusion that it is inappropriate to require a demonstration of compliance with aggregation validation limits at this time. As noted in the *NPRM*, the Commission has recognized that there are many regulatory difficulties in verifying compliance with aggregate validation $EPFD_{down}$ limits for NGSO FSS operations in the 10.7-11.7 GHz, 11.7-12.2 GHz, and 12.2-12.7 GHz bands.[29] Because of these difficulties, the Commission decided not to require a demonstration of NGSO FSS compliance with the aggregate limits in the *First Report and Order*.

In the *NPRM*, the Commission notes that the difficulties that prevented it from mandating verification of aggregate $EPFD_{down}$ have still not been resolved.[30] In particular, the Commission observes that a suitable methodology has not yet be developed to allow the calculation of the $EPFD_{down}$ produced by all NGSO FSS systems (including foreign systems not serving the United States). Without such a methodology, the Commission is unable to establish procedures for NGSO FSS applicants to follow to demonstrate compliance with the aggregate $EPFD_{down}$ limits. Accordingly, the *NPRM* proposes to defer further mandating the aggregate limits demonstration requirement.[31] Boeing supports this deferral. Given the fact that it will be many years until such a methodology is needed, the Commission should permit the international satellite community to

[29] *See id.* at ¶ 59 (citing *First Report and Order and Further Notice of Proposed Rulemaking*, ET Docket No. 98-206, FCC 00-418 (Dec. 8, 2000) at ¶ 107).

[30] *See id.* at ¶ 60.

[31] *See id.*

complete work on an approach for demonstrating compliance with aggregate limits before requiring NGSO FSS licensees to attempt to make such a demonstration.

V. FINANCIAL QUALIFICATIONS ARE NECESSARY TO PROVIDE CERTAINTY TO NGSO FSS LICENSEES

Boeing disagrees with the Commission's tentative decision in the *NPRM* not to impose a strict financial qualification standard for NGSO FSS applicants at this time.[32] The Commission reached this decision based on the assumption that potential applicants do not appear to have requirements that exceed the available spectrum or orbital resources. Boeing disagrees with this conclusion. It seems patently evident that the spectrum allocated for NGSO FSS in the Ku-band is inadequate to accommodate as many as seven commercially viable satellite communications systems. Instead, the only way to conclude that any of the proposed NGSO FSS systems will be able to operate successfully is to assume from the outset that some or most of the proposed systems will never be constructed.

The Commission acknowledges in its *NPRM* that it is unlikely that all proposed NGSO FSS systems will be launched and, while not saying it, the Commission appears to rely on this conclusion as the basis for its tentative finding that mutual exclusivity does not exist between the applicants.[33] Certainly, Boeing believes that the number of applicants greatly exceeds the spectrum available. In fact, Boeing's proposed hybrid spectrum sharing approach is premised on the assumption that some or most of the proposed systems will never be developed.

This said, Boeing acknowledges that the Commission is attempting to use stringent milestone enforcement as a means to avoid the administratively burdensome process of enforcing

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[32] *See id.* at ¶ 52.

[33] *See id.* at ¶ 16.

financial qualification standards. Unfortunately, strict milestone enforcement is not a costless substitute. By issuing licenses to all seven applicants, rather than just to those that are financially qualified, the Commission will greatly prolong the period of regulatory uncertainty for system developers that are trying to determine if they will gain access to sufficient spectrum resources to operate viably. Under the Commission's proposed approach, financially viable licensees must satisfy the Commission's milestone requirements and expeditiously build their systems, even though it may be many years before the licensees determine whether adequate spectrum will become available through attrition.

The increased regulatory uncertainty imposed on licensees will make it even more difficult to justify the tremendous cost of constructing global satellite networks. As a result, the Commission's tentative decision to refrain from adopting financial qualification requirements will actually increase the likelihood that some NGSO FSS networks will never be built and will never bring services to consumers. The Commission should instead reduce regulatory uncertainty by adopting strict financial qualification requirements for NGSO FSS networks.

In order to assist applicants that may not have already secured adequate financing, however, Boeing suggests that the demonstration of financial qualifications be made not at the time of licensing, but rather at the one-year milestone when the licensee must demonstrate that it has entered into a non-contingent satellite-manufacturing contract for its system.[34] Delaying the demonstration of financial qualifications until the one-year milestone date gives the applicant additional time to raise the capital necessary to implement its system after the Commission has granted its license. Any failure to raise sufficient capital within one year after grant cannot be blamed on regulatory uncertainty, but must rather be attributable to business or technical faults in

[34] *See id.* at ¶ 56.

the applicant's proposed system. Furthermore, by requiring a demonstration of financial qualifications concurrent with the first year milestone showing, the Commission's financial qualification rules will provide other NGSO FSS licensees a clear indication of how many systems will be required to share the limited spectrum resources that are available.

The Commission also requests comment on what demonstration of financial qualifications would adequately ensure an applicant's ability to proceed. The Commission proposes that each applicant be required to demonstrate internal assets or committed financing sufficient to cover construction, launch, and first-year operating costs of its entire system.[35] These funds must not be previously committed for any other purpose and must be separate and apart from any funding necessary to construct and operate any other licensed satellite systems.[36] Boeing supports these proposed demonstrations.

VI. BOEING GENERALLY SUPPORTS THE REMAINING PROPOSED SERVICE RULES FOR NGSO FSS SYSTEMS

Boeing generally supports the remaining service rules proposed by the Commission for NGSO FSS systems.

A. Blanket Licensing

Boeing supports the Commission's conclusion in the *NPRM* that blanket licensing is the most practical and efficient method of regulating user earth stations. Blanket licensing facilitates the introduction of user terminals and is critical to permit widespread distribution of NGSO FSS services the public. As noted by the Commission in the NPRM, such blanket licensing regimes

[35] *See id.* at ¶ 53.

[36] *Id.*

are already common in other satellite services.[37] Because there is no indication that blanket licensing of NGSO FSS user earth terminals would harm the public interest, the Commission should adopt a blanket-licensing regime for NGSO FSS user earth stations that is similar to the regime used in other satellite services.

Although Boeing strongly supports the use of a blanket-licensing regime for NGSO FSS user earth stations, it does not support the proposal to require an annual report of the number of user terminals actually brought into service under the blanket licensing authority.[38] Even though the Commission notes that a similar reporting requirement has been instituted in other satellite services, neither the *NPRM* nor the record in this proceeding demonstrate that such a requirement is necessary for NGSO FSS earth stations. Without clear evidence of the need for such a reporting requirement, the Commission should refrain from imposing unnecessary regulatory requirements on a nascent service.

B. Coverage Requirements

Boeing endorses the Commission proposal that NGSO FSS systems be capable of serving locations as far north as 70 degrees latitude and as far south as 55 degrees latitude for at least 75 percent of every 24-hour period.[39] As noted by the Commission, such a coverage requirement will help ensure efficient global use of limited spectrum resources. Boeing also supports the proposed ten-year licensing period and accompanying filing window for system replacement applications (no earlier than three months prior to, and no later than one month after, the end of

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[37] *See id.* (citing the Big LEO, 18 GHz, and 17.7-20.2 GHz and 27.5.-30.0 GHz service bands).

[38] *See id.* at ¶ 46 (citing the *Ka-band Third Report & Order*, 12 FCC Rcd at 22337 ¶¶ 67-68).

[39] *See id.* at ¶ 51.

the eighth year of the existing license).[40] In addition, Boeing agrees that there is no reason that the Commission should not follow its determination in its *DISCO I Order* that all fixed-satellite operators in the C-band and Ku-band could elect to operate on a common carrier or non-common carrier basis.[41]

C. Implementation Milestones

Boeing supports the Commission's proposed implementation milestones: a licensee must enter into a non-contingent satellite manufacturing contract for its system within one year of authorization; complete critical design review within two-years of authorization; begin physical construction of all satellites in the system within two and a half years of authorization; complete construction and launch of the first two satellites within three and a half years of authorization; and have the entire system launched and operational within six years of authorization.[42] Although enforcement of milestones has increasingly required significant investment of Commission time and resources, they are necessary to ensure the timely and efficient use of scarce spectrum resources. "Minimalist" approaches to implementation milestones, such as the proposed "Bringing Into Use" approach, are insufficient and are too unreliable to ensure timely and efficient use of spectrum resources. For this reason, Boeing supports the adoption of the implementation milestones as proposed in the *NPRM*.

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[40] *See id.* at ¶ 54.

[41] *See id.* at ¶ 55.

[42] *See id.* at ¶ 56.

D. International Coordination

Boeing agrees with the Commission that global satellite systems are more likely to succeed if individual administrations adopt complementary licensing schemes, and supports the general policy previously-adopted in the Ka-Band Service Rules Proceeding of pursuing international coordination for U.S.-licensed satellite systems consistent with U.S. domestic frequency band plans.[43] Furthermore, Boeing supports a requirement that all U.S.-licensed NGSO FSS systems coordinate with other NGSO FSS systems in other countries and the adoption of the proposed prohibition on exclusive arrangements.

E. Other Requirements

Boeing also supports the Commission's proposals for NGSO FSS reporting requirements, license terms, regulatory classification, orbital debris mitigation, and the sale of Commission licenses. Because these proposals either follow existing Commission rules, or delay Commission decision until the convention of a separate rulemaking proceeding, Boeing has no objection to these requirements.

CONCLUSION

Boeing supports the spectrum-sharing plan set forth in Option Three of the *NPRM* – Avoidance of In-Line Interference Events – as the preferred method of sharing between NGSO FSS systems. In the event that the Commission does not adopt Option Three, however, Boeing suggests the adoption of its alternative hybrid spectrum-sharing plan. Boeing's alternative hybrid plan combines the best elements of the four spectrum sharing options proposed in the *NPRM* and will enable a market-based approach to spectrum sharing that will achieve the

[43] *See id.* at ¶ 64.

principal objectives set forth by both the Commission and the NGSO FSS applicants in this proceeding.

The Commission is also correct to defer mandating the aggregate limits demonstration requirement until a proper methodology is established for determining compliance with the aggregate limits. Even then, Boeing notes that such a demonstration is unnecessary for the first three operational NGSO FSS systems. Boeing supports the application of strict financial qualifications for NGSO FSS applicants in order to avoid mutual exclusivity and to allow licensees to gauge as soon as possible the likely amount of available spectrum resources. In addition, Boeing supports the use of a blanket-licensing regime for NGSO FSS user terminal earth stations. Finally, Boeing generally supports the remaining service rules for NGSO FSS systems that were proposed in the *NRPM*.

Respectfully submitted,

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Appendix A: Proposed Final Rules

Title 47 of the Code of Federal Regulations, Part 25, is amended to include the following section:

Section 25.xxx. Intra-service Sharing provisions for NGSO FSS systems in the Ku-band.

(a) *Primary operations*. A NGSO FSS operator shall select primary spectrum assignments in each of the applicable Ku-band sub-bands (10.7-11.7 GHz, 11.7-12.2 GHz, 12.2-12.7 GHz, 12.75-13.25 GHz, 13.75-14.0 GHz, and 14.0-14.5 GHz) at the time its system becomes operational. A system is "operational" when the first satellite in a system reaches its intended orbit and initiates transmission and reception. The amount of spectrum available for selection as primary spectrum assignments by a NGSO FSS operator shall equal the total amount of spectrum in each Ku-band sub-band divided by the number of operational NGSO FSS systems. When more than one NGSO FSS system becomes operational, the total amount of spectrum in each Ku-band sub-band is divided by the number of operational NGSO FSS systems, and the initial NGSO FSS system to become operational is first to select its primary spectrum assignments in each sub-band. The second NGSO FSS system to become operational then selects its primary spectrum assignments, followed by the third system to become operational, and so on until all NGSO FSS operators with operational systems shall have selected primary spectrum assignments. Each NGSO FSS operator must notify the Commission in writing of its specific selected primary spectrum assignments.

(b) *Secondary operations*. All NGSO FSS system are permitted to operate anywhere in the Ku-band sub-bands, provided that they do not cause harmful interference to any NGSO FSS system that is operating within its primary spectrum assignments. "Harmful interference" occurs in this context when interference caused by the earth and space station emissions of any one other network operating in the same frequency band or bands is greater than six percent of the total system noise power under clear-sky conditions. All NGSO FSS systems operating outside of their selected primary spectrum assignments shall share equally the duty to avoid harmful interference to each other, regardless of which system was first to become operational.

(c) *Pooling*. Nothing in these rules shall prevent NGSO FSS operators from pooling spectrum assignments with systems using similar or identical orbital parameters and system designs in order to maximize coordination potential between their systems. An agreement to pool spectrum assignments shall not be construed to allow an NGSO FSS system operating outside of its primary spectrum assignments to claim a status superior to other NGSO FSS systems operating on a secondary basis for the purpose of the equal burden sharing pursuant to section 25.xxx(b).

(d) *Aggregation*. No demonstration of compliance with aggregate $EPFD_{down}$ validation limits is required for NGSO FSS systems operating in their primary spectrum assignments. The fourth operational NGSO FSS system must demonstrate that it can meet the aggregate $EPFD_{down}$ validation limits before it can operate outside its primary spectrum assignments on a secondary basis in any Ku-band sub-bands. Upon the operation of the fourth NGSO FSS system, the third NGSO FSS system to become operational must demonstrate compliance with aggregate validation limits before it can operate on a secondary basis in the fourth operational NGSO FSS system's primary spectrum assignments. Similarly, the fifth operational NGSO FSS system must demonstrate that it can meet

the aggregate $EPFD_{down}$ validation limits before it can operate outside its primary spectrum assignments on a secondary basis in any Ku-band sub-bands. Upon operation of the fifth NGSO FSS system, the third and fourth operational NGSO FSS systems must demonstrate compliance with aggregate validation limits before they can operate on a secondary basis in the fifth operational NGSO FSS system's primary spectrum assignments. This pattern of demonstrated compliance with the aggregate validation limits continues for the sixth and seventh NGSO FSS systems that become operational.