SES Americom, Inc.
Accelerated C-band Transition Implementation Plan
(filed September 30, 2021)

On June 1, 2020, the Commission's Wireless Telecommunications Bureau ("Bureau") confirmed that a sufficient number of eligible space station operators filed accelerated relocation elections, triggering the accelerated relocation of the 3700-4000 MHz band pursuant to the accelerated clearing schedule set out in the Report and Order issued in the C-band proceeding.[1]

By electing to accelerate clearing, SES committed to relocating its services and the associated Incumbent Earth Stations out of the lower 300 MHz per the below schedule:

Phase I: As of the date of this Transition Plan, SES has:

- Relocated all of its services out of the 3700-3820 MHz band exclusive to the contiguous United States ("CONUS");[2]
- Made necessary equipment changes on all associated Incumbent Earth Stations[3] located in 46 of the top 50 Partial Economic Areas ("PEAs") in CONUS designated by the FCC for clearing during Phase I;[4]
- Modified telemetry, tracking and control ("TT&C") operations to receive telemetry beacon above 4000 MHz;
- Consolidated gateway services[5] below 3820 MHz to two earth stations located in Hawley, PA ("Hawley"), and Brewster, WA ("Brewster") (collectively, "TT&C/Gateway").[6]

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[1] *Wireless Telecommunications Bureau Announces Accelerated Clearing in the 3.7-4.2 GHz Band*, Public Notice, GN Docket No. 18-122, DA 20-578 (WTB rel. June 1, 2020); *see also Expanding Flexible Use of the 3.7 to 4.2 GHz Band*, Report and Order and Order of Proposed Modification, 35 FCC Rcd 2343 (2020) ("*C-Band R&O*").

[2] A certain number of services, most notably from SES's international satellite fleet, will continue to be downlinked in the 3700-3820 MHz band into CONUS. These services will be received at the Hawley or Brewster teleports in accordance with the Commission's rules and *C-Band R&O*. 47 C.F.R. § 25.203(n); *C-Band R&O* ¶¶ 379-81.

[3] An incumbent earth station is defined as "an earth station that is entitled to interference protection pursuant to §25.138(c)" of the Commission's rules. 47 C.F.R. § 27.1411(b)(3).

[4] *See* 47 C.F.R. § 27.1411(b)(5) (defining "Earth station filtering").

[5] These gateway services will operate on an unprotected basis in the 3700-3820 MHz band unless otherwise authorized for protected use by the Federal Communications Commission ("Commission" or "FCC").

[6] See supra note 2.

Phase II: By December 5, 2023, SES will:

- Relocate all of its CONUS-exclusive services out of the 3820-4000 MHz band;[7]
- Make necessary equipment changes on all associated Incumbent Earth Stations located in all CONUS PEAs;
- Modify TT&C operations to receive telemetry above the 4000 MHz band and install swing antennas at Brewster and Hawley facilities for emergency TT&C operations; and
- Complete gateway consolidation to the TT&C/Gateway sites; the gateway services will operate on an unprotected basis in the 3700-4000 MHz band at the TT&C/Gateway sites unless authorized for protected service by the FCC.

The amended transition implementation plan described below ("Transition Plan") details the substantial, complex steps SES must take to meet its commitments in coordination with its customers and associated Incumbent Earth Stations. This Transition Plan accounts for all updates through the date of its filing to the prior SES transition plan that was filed with the FCC on July 7, 2021.[8]

As the Commission has acknowledged, the C-Band Alliance played a seminal role in the proceedings leading to the adoption of the *C-Band R&O* and the substantive decisions reflected in that Order. The C-band Alliance laid the foundation for all of the work by SES, Intelsat, and the other satellite operators that has flowed from the *C-Band R&O* until now.[9] Indeed, there are at least 344 references to the C-Band Alliance in the *C-Band R&O*. And just as SES and Intelsat were co-leaders of the C-Band Alliance, SES and Intelsat together have also taken a lead role in the substantive work of the C-band transition itself as further described below and throughout this Transition Plan.

This Transition Plan has been communicated to all of SES's U.S. C-band customers that receive services from SES within CONUS. SES has been extensively engaged with its customers and other C-band stakeholders for over three years to develop this Transition Plan. Since 2018, SES has held numerous meetings with its customers to understand their capacity needs now and in the future. SES also held numerous monthly joint meetings with Intelsat over the course of 2018 and 2019 to provide updates on the developing plans for customers, earth station operators,

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[7] See supra note 2.

[8] Letter from Brian D. Weimer, Counsel to SES Americom, Inc., to Marlene H. Dortch, Secretary, FCC, GN Docket Nos. 18-122 & 20-173, Attachment (filed July 7, 2021) ("July 2021 Transition Plan"). *See also Wireless Telecommunications Bureau Opens Window For Eligible C-Band Satellite Operators To Account For Final Phase I Updates to Their Transition Plans*, Public Notice, GN Docket Nos. 18-122 and 20-173, DA 21-1100 (rel. Sept. 3, 2021).

[9] See, e.g., *C-Band R&O* ¶ 34.

installers and other interested stakeholders. On two occasions (in September 2018 and April 2019), SES and Intelsat held joint in-person meetings with customers, MVPDs, and other earth station operators to demonstrate the capabilities of the filters SES and Intelsat jointly developed (*i.e.*, while receiving satellite signals in the presence of 5G interference) as well as to discuss other elements of the planned transition. Webinars were held with industry groups such as ACA Connects and the National Association of Broadcasters ("NAB") to make their members aware of the impact of the C-band clearing on their operations and the importance of registering their antennas with the International Bureau. At numerous industry conferences and tradeshows, such as SCTE Cable-Tec, the NCTC WEC, the NAB Radio Show, the NAB Show, the Mid-America Cable Show and the ACA Summit, SES had a presence and discussed the C-band clearing, filters and related activities with numerous earth station operators to obtain their feedback. SES has also engaged in numerous direct one-on-one discussions with MVPDs seeking detailed input on the impacts of clearing at MVPD earth stations.

Since the adoption of the *C-Band R&O*, a multi-stakeholder group comprising "incumbent earth stations (including MVPDs and broadcasters), incumbent space station operators, wireless network operators, network equipment manufacturers, and aeronautical radionavigation equipment manufacturers" has formed to "provide valuable insight into the complex coexistence issues in the C-Band and provide a forum for the industry to work cooperatively towards efficient technical solutions to these issues."[10] SES presented its initial transition plan (filed June 19, 2020) to Technical Working Group #2 of the Industry Multi-Stakeholder Group on June 26, 2020 to seek industry input, and presented the revised plan, filed on August 14, 2020, to the Group on September 10, 2020. SES and the other operators have continued to participate in the Technical Working Group #2 meetings to provide updates on their transition on a monthly basis.

SES has also been working with numerous radio, cable, and broadcasting associations to communicate the latest moves regarding the C-band transition. A number of associations have agreed to post information on their websites and newsletters, including NCTC, ACA Connects, NAB, and NRB (National Religious Broadcasters). ACA Connects conducts monthly webinars at which SES representatives present status and upcoming activities to ACA Connects members and address any questions and concerns they may have. Additionally, ACA Connects and SES have an ongoing dialog to address specific member questions and concerns outside of the regularly scheduled webinars. In all cases where SES has presented material to groups of stakeholders, Incumbent Earth Station operators that elected to accept the lump sum relocation payment were invited and received all of the same information about SES's transition process and timing as all other SES-associated Incumbent Earth Station operators. While we had planned to begin attending industry meetings in Summer 2021, in person meetings have been cancelled due to COVID-19 restrictions. We will still participate virtually whenever practical. SES has provided a helpdesk and email address to answer questions and concerns.

SES, Intelsat, and the other satellite operators engage on a weekly basis with RSM US LLP in its role as the Relocation Coordinator to ensure that all Incumbent Earth Stations are either

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[10] *C-Band R&O* ¶ 333.

associated with a satellite operator's transition plan or otherwise dispositioned, as reported to the FCC. The Relocation Coordinator maintains a master list of Incumbent Earth Stations published by the FCC and their disposition at any given time during the clearing process. On a weekly basis, the satellite operators provide the Relocation Coordinator with any changes to their list of associated Incumbent Earth Stations. These changes may include (1) confirmation of clearing, (2) confirmation that the earth station is not receiving the satellite operator's service and so not associated with the satellite operator, (3) evidence that the earth station operator has confirmed that the Incumbent Earth Station is no longer receiving any satellite service, *e.g.* it has been decommissioned, the registration included too many antennas or the relevant antenna is receiving in a band other than C-band, or (4) the earth station operator is not responsive to repeated outreach efforts. In the latter two cases, the Relocation Coordinator takes steps to confirm an Incumbent Earth Station has been decommissioned or is not otherwise receiving C-band satellite services, or to contact the earth station operator in the latter case. The Relocation Coordinator then provides this list to the FCC for their further action.

As of the date of this filing, each Phase I Incumbent Earth Station has either been assigned to a satellite operator for clearing by December 5, 2021 or it has been provided to the FCC for their further action.[11] Appendix C includes all of the Incumbent Earth Stations included on the FCC's September 15, 2021 List of Incumbent Earth Stations that SES has confirmed are receiving at least one service from SES subject to Phase I clearing or has been assigned to SES by the Relocation Coordinator. In light of this ongoing process, it would be premature for a satellite operator to certify at this time that it has completed its Phase II clearing obligations for all associated Incumbent Earth Stations.

SES and Intelsat also presented the passband filter specification and provided an update on filter production to the Technical Working Group #1 of the Industry Multi-Stakeholder Group on August 13, 2020.[12] The collective input received from years of extensive discussions, webinars, demonstrations, and industry conferences has led to the development of this Transition Plan. SES has made commercially reasonable efforts to incorporate customers' individualized needs, but developed this Transition Plan primarily to ensure the completion of accelerated relocation within the deadlines set forth in the *C-Band R&O*, with minimal impact to customers and within a reasonable cost.

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[11] *International Bureau Identifies Earth Station Antennas on C-band Incumbent List that May be Inactive or Otherwise Not Operational on the 3.7 GHz Band*, Public Notice, IB Docket No. 20-205, DA 21-1206 (rel. Sept. 27, 2021) ("September 2021 90-Day Notice"). SES notes that if an Incumbent Earth Station identified in the FCC's 90-day notice is ultimately determined to be receiving SES C-band satellite services, SES will promptly transition the earth station.

[12] *See* Letter from Neeti Tandon and Robert Weller, Technical Working Group #1 of the C-band Multi-stakeholder Group, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 18-122 (filed Nov. 13, 2020).

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I. Details of Transition

A. Existing Space Stations Subject to Transition (§ 27.1412(d)(1)(i))

SES has been providing C-band service in the United States for over 40 years and was instrumental in developing the resilient and cost-effective television and audio distribution and data network ecosystems that relies on C-band satellite service today. In developing this vibrant satellite ecosystem, SES has procured and launched dozens of satellites. Sixteen such satellites are in service today with satellite services that could be impacted by the clearing of the 3700-4000 MHz band.

The Commission's rules require transition plans to list "[a]ll existing space stations with operations that will need to be transitioned to operations above 4000 MHz."[13] SES understands that this would include any satellite that is intentionally downlinking in the 3.7-4.0 GHz band to earth stations in CONUS.[14] SES also understands that this includes any other space station transition activities necessary for SES to cease downlinking to CONUS in the 3.7-4.0 GHz band by the accelerated relocation deadlines.[15] SES operates several such satellites under Commission authority to provide service to the United States using the 3.7-4.2 GHz band.[16] A full list of these satellites is provided in Appendix A.

To identify the satellites that must be transitioned to meet the accelerated relocation deadlines, SES leveraged its internal fleet management resources to determine the most efficient way to migrate customers on SES's satellite fleet to clear spectrum while ensuring continuity of service. Much of the early work on this topic was conducted through the C-Band Alliance in close cooperation with the other satellite operators, especially Intelsat.

Among the elements considered were:

- Satellite capabilities, performance, and available capacity;
- Orbital location field of view, operational restrictions, and satellite penetration into CONUS earth stations;
- Protection schemes available on the satellites and across the fleet;

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[13] 47 C.F.R. § 27.1412(d)(1)(i).

[14] *See* 47 C.F.R. § 25.147 ("The 3.7-4.0 GHz portion of the band is being transitioned in CONUS from FSS GSO (space-to-Earth) to the 3.7 GHz Service."); *see also C-Band R&O* ¶ 175.

[15] *See C-Band R&O* ¶ 204 (permitting as reimbursable transition costs non-CONUS "system modifications . . . as a direct result of the transition in [CONUS] to make spectrum available for flexible use").

[16] These satellites are authorized through a U.S. license or through a grant of U.S. market access.

- Contractual obligations and future commercial needs;
- Channel line-up and programming requirements; and
- Specific mobility[17] and government customer constraints and requirements.

It is important to note that orbital locations are not fungible, and certain orbital locations are better suited for certain services compared to others. Only satellites located within the U.S. orbital arc are suitable for the delivery of broadcast and cable services on which nearly 120 million American households rely. Yet even within the U.S. orbital arc, not all orbital locations are suitable for all applications. For example, the distribution of cable video services requires strict 50-state coverage, effectively narrowing the orbital locations (specifically, between 135° W.L. and 99° W.L.) within which satellites used for cable distribution can be placed to maintain "look" angles able to see New England, Maine, and Alaska. It is critically important to maintain sufficient antenna elevation angles after the transition process is complete because of the aggressive power flux density limit adopted in the *C-Band R&O*, which assumes an earth station antenna elevation angle of at least 19 degrees.[18]

SES has developed a robust broadcast and cable video distribution neighborhood using its orbital locations at 101° W.L., 103° W.L., and 105° W.L. These orbital locations offer 50-state coverage, and earth station antennas receiving content carried on satellites operating at these orbital locations are already pointed to this four-degree slice of the geosynchronous orbital arc.

Orbital locations outside the U.S. arc are not suitable for distribution of broadcast or cable video services because of the low look angles and lack of 50-state coverage. Customers providing this video programming thus cannot simply be moved to a C-band satellite outside the U.S. orbital arc to clear spectrum for 5G terrestrial operations. Moreover, SES uses its non-U.S. orbital locations for distribution of broadcast programming in other regions and for data applications such as maritime and aeronautical mobile satellite services. For example, SES satellites in orbital locations 20° W.L. to 47.5° W.L., are unable to provide service to the western portion of the United States but can offer coverage between the east coast of the United States and Europe. Similarly, NSS-9 at 177° W.L. is unable to provide service to the eastern portion of the United States but offers connectivity between the U.S. west coast and Asia.

As a result, clearing the lower 300 MHz in CONUS will indirectly impact the loading of satellites that mainly serve areas outside CONUS but that also need to land services in CONUS, for either further distribution to consumers or monitoring of services intended for non-U.S. consumers.

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[17] Specifically, SES considered maritime services where ship-to-shore and shore-to-ship traffic was required to be assessed to develop the most efficient and effective transition approach.

[18] *See C-Band R&O* ¶ 363, n.799.

B. New Satellites to be Launched (§ 27.1412(d)(1)(ii))

In addition to the transitions that need to occur on existing satellites as described above, SES needs to invest more than $1.25 billion to manufacture and launch new satellites to ensure continuity and quality of existing service to nearly 120 million U.S. households in the accelerated relocation timeframe established in the *C-Band R&O*.[19] These new satellites are necessary to guarantee that sufficient on-orbit capacity exists to provide substantially the same or better service for current customers after the transition is complete.[20]

Prior to the FCC's Notice of Inquiry,[21] SES was finalizing the consolidation of cable programming to the satellites operating at 101° W.L., 103° W.L., and 105° W.L. On that basis, SES had made the business decision not to place new C-band satellites at 135° W.L. and 131° W.L., and instead to use those orbital locations for non-cable video distribution services, such as mobility services via inclined-orbit satellites. SES had determined it could serve existing and future business requirements with the 500 MHz of downlink bandwidth available at the center of the arc, 101° W.L., 103° W.L. and 105° W.L. (3 x 500 MHz = 1500 MHz), including protection transponders (described below). Further, without a compelling customer use case (for example long term commitments by major customers), when the time came to replace the satellite at 103° W.L. (SES-3), SES's nominal fleet plan has long been to migrate its cable video distribution customers primarily to the satellites at 101° W.L. and 105° W.L.

Because the *C-Band R&O* requires in-CONUS C-band distribution to be consolidated into 200 MHz of downlink bandwidth, SES will need a total of six satellites to support its existing C-band cable video distribution customers. SES will need five active satellites to ensure at least 1000 MHz of downlink bandwidth is available to continue existing services (*i.e.*, 5 x 200 MHz = 1000 MHz). This means that SES must construct new C-band satellites and launch them into the orbital slots not only at 103° W.L. but also at 131° W.L. and 135° W.L. as well. SES must replace the C-band satellites at these locations to maintain its service continuity commitments to

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[19] *Id.* ¶ 194. Appendix D details SES's estimated transition costs.

[20] *See C-Band R&O* ¶ 153 ("We find our approach here . . . provid[es] incumbent space station operators the flexibility to launch additional satellites to achieve an efficient transition to the upper portion of the band.").

[21] *Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz*, GN Docket No. 17-183, Notice of Inquiry, 32 FCC Rcd 6373 (2017).

existing customers.[22] SES will also need another satellite to provide required capacity for protection from transponder or satellite failures.[23]

SES has customers on its existing satellites who have contractual "protection" rights, which obligate SES to maintain transponders (generally on separate satellites from where the customers are located, in case of a satellite failure) that are always available to restore service within a matter of days if those customers experience transponder failures or service disruptions.[24] At present, those commitments are met using transponders on SES's existing satellites.[25] But with only 200 MHz of on-board downlink bandwidth per satellite, after careful analysis, SES has determined that the only realistic way to maintain its service restoration obligations is to use a dedicated "in-orbit spare." SES will meet this obligation by co-locating a second C-band satellite at 103º W.L. to satisfy contractual restoration obligations for customers at 105º W.L., 103º W.L., and 101º W.L., and therefore providing substantially the same or better[26] service after the transition as they had before.

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[22] Eutelsat has suggested that SES does not need to launch a new satellite to 135° W.L. because it relocated AMC-8 to the orbital location. Comments of Eutelsat S.A. on the Transition Plans filed by SES Americom, Inc. and Intelsat License LLC, GN Docket Nos. 18-122 & 20-173, at 5 (filed July 13, 2020). As noted in the modification application requesting authority to relocate AMC-8, it has experienced solar array circuit failures and battery cell failures that have affected the total power available to the spacecraft, and is now configured only for inclined operation. SES Americom, Inc., (Call Sign S2379) File No. SAT-MOD-20200413-00033 (granted July 1, 2020). As a result, AMC-8 has sufficient capability to support SES's current commercial needs, but it does not have the on-board capabilities necessary for station-kept operations required to support the distribution of video services from 135° W.L. pre- and post-transition.

[23] *See C-Band R&O* at n.102 (acknowledging SES's grooming plan included "SES also operating an in-orbit spare").

[24] *See* Letter from Matthew S. DelNero, Counsel for Discovery, Inc., Fox Corp., The Walt Disney Company, and Univision Communications, Inc., to Marlene H. Dortch, Secretary, FCC, GN Docket Nos. 18-122 & 20-173 (filed July 31, 2020); Letter from Brian D. Weimer, Counsel for SES, to Marlene H. Dortch, Secretary, FCC, GN Docket Nos. 18-122 & 20-173 (filed July 29, 2020).

[25] Prior to the *C-Band R&O*, 500 MHz of downlink bandwidth at each of the satellites in the three center arc orbital locations provided SES with sufficient spare capacity to satisfy its service restoration obligations.

[26] *See C-Band R&O* ¶ 194 ("'Reasonable' relocation costs are those *necessitated by the relocation* in order to ensure that incumbent space station operators continue to be able to provide substantially the same or better service . . . . So long as the costs for which incumbents are seeking reimbursement are *reasonably necessary* to complete the transition in a timely manner (and reasonable in cost), such expenses would be compensable.") (emphasis added).

The in-orbit spare will not be actively broadcasting while it is co-located with an operational satellite at 103° W.L. It will only begin broadcasting in the event one of the satellites in the center of the arc experience a service outage that impacts a customer who has purchased full service protection. The transponders on the in-orbit spare are part of SES's existing service to its customers who have been and continue to pay significant amounts for SES to have that additional restoration capacity available if needed.[27] Without an in-orbit spare, if one of the satellites operating in the U.S. arc fails, it may take months or years to recover the service, forcing SES to breach its contractual obligations to existing customers and significantly disrupting the customers' existing services. Without the in-orbit spare, SES will not be able to provide substantially the same or better service for current customers post-transition as required by the *C-Band R&O*.

Consequently, SES's transition requires the manufacture and launch of four C-band spacecraft comprising: (i) a replacement at 135º W.L.; (ii) a replacement at 131º W.L.; (iii) a replacement at 103º W.L.; and (iv) one in-orbit spare satellite (to be collocated at 103º W.L.) to meet existing contractual obligations to customers for in-orbit protection. These satellites will offer C-band-only (*i.e.*, no Ku-, Ka- or other frequency payloads) service over the 50 United States at similar or improved power levels.[28] The satellites have been designed to ensure substantially the same or better service to current customers and Incumbent Earth Station operators.[29] While these satellites will include incidental coverage of areas around the United States (similar to current SES satellites at 101 º W.L., 103 º W.L. and 105 º W.L.), such as Mexico, SES does not intend to provide international-only services over these satellites.

The four C-band spacecraft are planned to be launched by the end of Q3 2022, after which the relevant services will be transitioned as described in more detail below. See Table 1 below.

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[27] Id.

[28] All of the new satellites will provide an EIRP performance over CONUS which is better than what is currently provided by SES-3 and AMC-11 (the satellites being replaced), with a minimum EIRP of 41 dBW over CONUS (and many areas reaching an EIRP of 42-43 dBW).

[29] Certain commenters requested that link budgets of replacement satellites be included in transition plans. *See* Comments of ACA Connects, GN Docket No. 20-173, at 22 (filed July 13, 2020) ("ACA Connects Comments"). For its part, SES's replacement satellites are designed to deliver service using operating parameters (including power levels) that are the same or better than the satellites that will be replaced. Link budgets—which are highly specific to a particular earth station operator—can therefore not be provided on a generic basis without being misleading.

135ºW	131ºW	105ºW	103ºW		101ºW
[AMC-10R]	[AMC-11R]	SES-11	[SES-3R]	New Spare Satellite	SES-1

Table 1: Future Fleet Deployment

SES's nominal launch plan is to launch the first two satellites to 131° W.L. (AMC-11R) and the in-orbit spare position at 103° W.L. The second two satellites will operate at 135° W.L. (AMC-10R) and 103°W.L. (SES-3R). While the satellites have been designated as SES-18, SES-19, SES-20, and SES-21 with the manufacturers, the location of each of these named satellites will depend upon the order in which they are launched. SES will launch the first satellites that are available to meet its nominal replacement schedule. To assist stakeholders (namely, SES customers and other Incumbent Earth Stations) in identifying transition satellites,[30] SES uses the placeholder naming convention shown in brackets in Table 1.

As is typical in satellite procurements, industry-wide issues concerning the reliability of certain components and their testing can arise. This is no different for the satellites under procurement as mentioned in this Transition Plan. While some delay outside of SES's control has arisen as a result of such issues, SES continues to work collaboratively with its vendors to ensure that the deadlines in the Transition Plan remain on track.

Additionally, as noted in SES's prior Quarterly Reports, the COVID-19 crisis continues to impact SES's satellite manufacturing programs. All SES-associated satellite manufacturers have received notifications from some of their subcontractors indicating that the COVID-19 pandemic has impacted their production capabilities, and consequently, some component forecast delivery dates are delayed. Notwithstanding the impacts of the industry-wide issues affecting certain satellite components and the COVID-19 pandemic, the forecasted delivery dates for the satellites remain on track. Critical paths for each spacecraft are well-identified and the satellite manufacturers are required to enforce heightened focus on their supply chains to ensure the critical deliveries will come on time and will not drive the overall delivery schedules.

The need to meet very aggressive transition deadlines poses significant risks for SES. The new satellites will require between two and three years to manufacture and at least two additional months for launch (including shipment and a launch campaign), assuming all launches go as scheduled and that the manufacturer finishes on time so the pre-reserved launch slots can be utilized. Following launch, up to eight weeks are needed for the satellites to reach their orbital destination, be fully tested in orbit, and commence commercial service.

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[30] Including an "R" on a satellite designation indicates that the satellite is a replacement for an existing satellite that will be retired from an orbital location. Since the AMC-10 satellite formerly was located at 135° W.L. (it has since been re-orbited), we use AMC-10R to indicate the new satellite that will be located at 135° W.L. Each of these locations will subsequently be the location for one of the satellites SES-18, SES-19, SES-20, or SES-21.

SES therefore also had to order and start construction of spare satellites and launches as backup for the satellites to be deployed. If the primary satellites are lost due to launch failures or the inability to place the satellite in the proper orbit, or alternatively, if some of the first four satellites experience significant manufacturing delays, it would be much too late to start construction of new satellites and still meet the tight timelines required for spectrum clearing by early December 2023. It is a common and commercially reasonable practice in the satellite industry to construct ground spares to be launched only in the event of a satellite failure (at least when alternate contingency plans are not available, which is the case here given the need to add so many new satellites so quickly to meet aggressive transition deadlines). Given the truncated timing, there would not be another two to three years of flexibility if there is a launch failure.

To provide assurance to customers that it can maintain service continuity, and consistent with its August 2020 Transition Plan, SES contracted with Thales Alenia Space France in June 2020 to manufacture two ground spares. The manufacturing of the first ground spare satellite (SES-22) started immediately in order to be ready for launch within a few weeks after any potential launch failure of one of the first two dual launches (described below). The manufacturing of the second ground spare (SES-23) began on June 1, 2021, consistent with the SES contingency fleet plan. Subject to the successful launch and deployment of the first four satellites included in this Transition Plan, SES will then determine whether or not to finalize the second ground spare program and will seek reimbursement only for the costs incurred until that moment for the second ground spare program, including termination liability.

As of the date of this amended Transition Plan, the satellite procurement programs are progressing as planned with all three satellite manufacturers. Boeing, Northrop Grumman and Thales Alenia Space France have successfully completed the design phases and most of the components have been manufactured, tested, and delivered. Assembly, integration, and testing at the subsystem level has started for the SES-18, SES-19, SES-20, SES-21 and SES-22 satellites. However, as noted above, the delays caused by the industry-wide manufacturing issues and the COVID-19 pandemic have reduced the margin in our satellite manufacturing schedule. SES continues to work with the impacted parties to mitigate the effects of these impacts to our overall satellite procurement schedule.

SES also determined that using dual launches for its new satellites is the most failsafe and commercially reasonable approach under these circumstances. SES and Intelsat are constructing new C-band satellites at about the same time, and are planning to launch all these satellites in a matter of a few months, since both operators are working towards the same deadline. Because more than ten replacement C-band satellites will need to be launched for SES and Intelsat, essentially concentrating a large number of launches during the same launch period, and since the new C-band satellites are in addition to the planned launches of other satellites already in the manifests of launch providers, launch capacity in the relevant time frame is quite limited. SES determined that a dual-launch deployment strategy is necessary to ensure it could meet the Commission's clearing deadlines and a single launch strategy would not be logistically

feasible.[31] Additionally, multiple single launches would expose SES to additional launch failure risk and increase the likelihood of launch delay due to launch vehicle unavailability. Given that SES needs *all* of its replacement satellites to be launched successfully and on time to meet the Phase II deadline, a dual-launch strategy significantly reduces the execution risk.

Procuring six satellites (four nominal and two spare satellites) is the optimal and necessary strategy for SES to ensure service continuity for existing customers and to ensure the C-band spectrum is cleared consistent with the FCC's accelerated relocation deadlines.

For the same reasons as the purchase of the two ground spare satellites, SES is purchasing additional launches for the ground spare satellites to address the risk of launch failure. Launch vehicles of the type needed for launch of the ground spare satellites are expected to require nearly two years to complete, so the contingency launches need to be purchased well in advance to ensure the deadline is met in case of a launch failure. In July and August 2020, SES signed contracts with ULA and SpaceX to launch the first four satellites in 2022. Mission requirement reviews are progressing according to plan with ULA and SpaceX. As of the date of this amended Transition Plan, spacecraft and launch vehicle integration analyses are near completion for all programs with no programmatic or technical risks identified. The 30-day launch slot selection for SES-18 and SES-19, SES-20 and SES-21, and SES-22 are on track to be confirmed by February 2022. The launcher for SES-23 has not been selected yet.

In the event of any launch failures, SES will submit a claim to the insurers. In the event the claim results in a reimbursement to SES from the insurers, and to the extent the claim covers amounts that have been reimbursed by the Relocation Payment Clearinghouse, SES will in turn refund the appropriate amount to the Relocation Payment Clearinghouse.

C. Plan to Migrate Existing Services (§ 27.1412(d)(1)(iii))

SES is committed to relocating all services that are contracted as of the date of each accelerated clearing deadline in advance of the deadline.[32] SES transitioned all Phase I services by the date of this Transition Plan and expects to transition all Phase II services by August 31, 2023. SES is working very closely with Intelsat to meet these deadlines. To accomplish this, SES has worked to develop an efficient transition process for all affected services to minimize as much as possible the impact to SES customers and their affiliated earth stations. Under this amended Transition Plan, there are 171 services in total that are impacted by the C-band repurposing: 108 services on domestic satellites (SES-1, SES-2, SES-3, SES-11, AMC-11, AMC-3) and 63 services on international satellites (SES-4, SES-6, SES-14, NSS-9, NSS-10). SES will be required to perform 118 frequency/satellite moves for services, and 53 gateway moves, 11

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[31] In the course of SES's analysis and discussions with satellite manufacturers and launch service providers, it was determined that use of single launches and one fewer ground spare was not logistically feasible on the Commission's accelerated clearing timeline.

[32] 47 C.F.R. § 27.1411(b)(4) (defining "Earth station migration").

services require compression/modulation upgrades (and also frequency/satellite moves), and 6 mobile services require frequency moves on the same satellite.

During Phase I, SES transitioned a total of 103 services to clear all services out of the 3700-3820 MHz band: 78 services on domestic satellites (SES-1, SES-2, SES-3, SES-11, SES-15,[33] AMC-11, AMC-3) and 25 services on international satellites (SES-4, SES-6, SES-14, NSS-9). These transitions can be broken down as follows: frequency/satellite moves for 86 services and gateway moves for 17 services. Also, SES completed the compression/modulation upgrades (and also frequency/satellite moves) associated with the 11 services noted above which is included in the 86 services needing frequency/satellite moves.

To maintain continuous service and service quality, when a service is migrated from one frequency to another on the same satellite or a different satellite SES provides customers with a period of dual illumination during which customers will commence the new service on a phased basis before giving up access to the prior service. These dual-illumination periods will allow for Incumbent Earth Stations to have sufficient time to repoint or install new antennas, as well as make other necessary adjustments (such as installing feeds and LNBs). Dual-illumination minimizes service interruption arising from the transition. As of the date of this amended Transition Plan, SES has completed all Phase I satellite transitions, which include radio, broadcast TV, cable network services and other services.

Appendix B provides (1) a detailed list of the services that were migrated under the Phase I plan, (2) a detailed list of services that will be migrated by the Phase II deadline, (3) the satellites and frequencies they will be moved to, and (4) the start and end of the transition period for each service.[34] As previously stated, the new satellites are designated with an "R" at the end of the satellite name to reflect replacement satellites. Customers whose service will be supported at 103° W.L. or 131° W.L. will ultimately be receiving service from a new satellite (with an "R" designation) even if they initially receive service on an existing satellite at those orbital locations.

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[33] As previously described in the Transition Plan, SES offers service through its SES Government Solutions subsidiary to Raytheon Technologies, which operates an FAA / WAAS system on SES-15 at the SES South Mountain TT&C/Gateway location in Somis, CA. The service includes reception of the lower TT&C frequency which required a transition from C-band to Ka-band to allow for continued satellite tracking post-transition through the addition of a Ka-band sidecar antenna and feed assembly on the WAAS antenna at the Somis, CA location.

[34] ACA Connects requested that SES and Intelsat include additional migration data that is outside the scope of the *C-Band R&O* and the Commission's rules. *Compare* ACA Connects Comments at 22-23 (requesting a table that includes "bit rate, video compression, modulation, and video resolution" for each video feed), *with C-Band R&O* ¶ 303 (requiring transition plans include a grooming plan for existing services, "including the pre- and post-transition frequencies that each customer will occupy"). *See also* 47 C.F.R. § 27.1412(d)(1)(iii).

Since the services shown in Appendix B are for actual SES customers, to protect the confidentiality of SES's customers each service is identified by a "Service ID."[35] Each customer has been informed of its Service ID, and therefore can easily confirm that the transition described in Appendix B reflects the plan SES has communicated to it. Services currently above 4.0 GHz and not requiring any type of transition are not included in Appendix B.

The details of each service transition scheduled for Phase II, such as the service's ultimate satellite and frequency as well as the timing of the transition, are subject to change, particularly due to actions taken by SES's customers. For example, an SES customer may choose not to renew services, may ask to complete its transition early, or may mutually agree with SES to modify the transition satellite to which its service is to be relocated, or the frequency, timing or other factors affecting its service or the transition process. Appendix B reflects the status of each service: Transition Completed, In Transition, Pending Transition, Deleted, or Added—indicated by a "C", "I", "P", "D" or "A", respectively as compared to the Appendix B submitted in our July 2021 Transition Plan.

Since filing our July 2021 Transition Plan, 2 services were removed from the plan, 1 service was added, and 32 services completed transitions. Appendix B provides an explanation for these changes.

D. Technology Upgrades to be Implemented (§27.1412(d)(1)(iv))

The *C-Band R&O* notes that "upgrades such as video compression, modulation/coding, and HD to SD down-conversion at downlink locations, may be necessary to accomplish efficient clearing."[36] To ensure that it can deliver substantially the same-or-better services with only 40 percent of the spectrum being usable for continuing C-band communications, SES has explored ways to reduce the capacity needs of existing services through technology upgrades.

SES determined that one customer currently receiving services from 11 transponders on one SES satellite required compression/modulation technology upgrades for the service to continue to be

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[35] One commenter requested that SES identify its customers by name. Comments of Verizon, GN Docket Nos. 18-122 & 20-173, at 2-3 (filed July 13, 2020) ("Verizon Comments"). But due to SES's confidentiality obligations to its customers, SES cannot disclose the names of its customers in this appendix. *See also C-Band R&O* at n.684 ("We clarify that nothing in this *Report and Order* is intended to affect or change the terms of any private contractual arrangement."). And given that Service IDs already provide SES's customers with the information needed to ensure that their services are being migrated appropriately, SES has not identified a need to specify confidential customer information. But to the extent the Commission determines that such information is "necessary to effectuate the transition," SES requests that the Commission affirmatively state as much. *See id.* at n.694.

[36] *C-Band R&O* ¶ 194.

provided at the same quality level after the relocation.[37] Specifically, the pre-transition services encoded using MPEG-2 will be upgraded to MPEG-4, which will support substantially the same or better service in much less bandwidth. With technology upgrades, the customer's post-transition needs are reduced to only 6 transponders in Phase 1 and to 5 ½ transponders in Phase II,[38] which will allow those services to continue to be downlinked on a single satellite which is necessary for this particular service. Changes are needed at the customer's uplink locations as well as at the receiving Incumbent Earth Station locations. At the customer uplink locations, encoding, statistical multiplexing, modulator and other equipment are required. At the Incumbent Earth Station downlink locations, integrated satellite receiver/decoders ("IRDs"), multiplexing, and other equipment may be required.

This use of compression technology is necessary in light of the very limited orbital slots available to SES to maintain its C-band service obligations with only 40 percent of the available capacity. This approach works well from a technological (and economic) perspective because of the large number of transponders used by this customer; the same approach would not be as effective for customers using a small number of transponders.

As previously reported in SES's quarterly reports, all uplink compression equipment has been shipped to and installed at the earth station locations associated with the SES services requiring compression technology. All of the equipment has been configured and tested and all uplink services subject to compression are currently being dual illuminated as of the date of this amended Transition Plan. All of the downlink equipment, including demodulators, decoders, transcoders and related equipment, has been shipped to Incumbent Earth Station operators – including lump sum electees – receiving the SES satellite services requiring compression technology. All of the Incumbent Earth Stations subject to SES's Phase I Transition Plan and subject to compression have been fully transitioned and are on air. The remaining Phase II

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[37] *Id.* ("Earth station migration includes . . . technology upgrades necessary to facilitate the repack, such as compression technology or modulation."); Letter from Brian D. Weimer, Counsel for SES, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 18-122, at 5 (filed July 8, 2020) ("the space station operators' control over video quality is inherently limited to a defined network distribution architecture that involves transmit and receive antennas located on the spacecraft and in rare cases—most of which are not video networks—at antennas located at earth stations.").

[38] All of the SES satellites designed to provide broadcast services over the United States offer 24 transponders that cover 500 MHz of downlink C-band spectrum. Once satellite services are limited to 200 MHz over CONUS, only 9 ½ transponders will be available on each satellite for CONUS services. The customer's business model required that all of its services be distributed from one satellite, so it was not possible to distribute the original 11 transponders of service to multiple SES satellites, necessitating compression. Furthermore, to accommodate all of the SES services pre-transition, compression of some services would be required. For both of these reasons, the 11 transponders mentioned were considered ideal candidates for compression technology.

Incumbent Earth Stations subject to compression are expected to be transitioned by October 31, 2021.

For services below 4.0 GHz on SES's international satellites that cannot be transitioned above 4.0 GHz due to unavailable capacity on those international satellites, SES will be performing other types of technology upgrades for customers that require transition of data services that operate on an SES-supplied platform or a platform at a customer's facility. SES is building a duplicate platform, including hub chassis, line cards, modems, core network components, and other equipment at one of the TT&C/Gateway sites where downlinking services below 4.0 GHz will be permitted. Once built, the data service will be transitioned from the existing platform to the new platform. The original platform will be decommissioned after the service is fully transitioned. As of the date of this Transition Plan, all Phase I data services have been transitioned from their original platforms to the new platform and the original platforms are no longer receiving services below 3.82 GHz.

Appendix B also sets forth information on when a particular service required a technology upgrade as part of its transition.

E. Number and Location of Incumbent Earth Stations to be Transitioned (§27.1412(d)(1)(v)-(vi))

Appendix C identifies Incumbent Earth Stations that are (1) included on the FCC Incumbent Earth Station list released on September 15, 2021;[39] and (2) are associated with SES – those receiving at least one service from an SES satellite,[40] or (3) antennas not associated with SES satellites that are Incumbent Earth Stations that are considered "rover" antennas – those that are frequently repointed by the Incumbent Earth Station operator to various satellite operators' satellites, or, Incumbent Earth Stations that were not necessarily pointed at any satellite and are used as backup or spare antennas that were either assigned to SES by the Relocation Coordinator, or voluntarily accepted by SES to transition. SES confirms that all associated earth station antennas and feeds for which SES is responsible for Phase I are listed in Appendix C to this Transition Plan. To the extent necessary, SES will file a further amended transition plan reflecting all of the Incumbent Earth Stations that meet the above criteria prior to filing its Phase II clearing certification.[41]

Section 27.1412(d)(1)(vi) requires satellite operators to provide "an estimate of the number and location of Incumbent Earth Station antennas that will require retuning and/or repointing in order

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[39] *International Bureau Releases Updated List of Incumbent Earth Stations in the 3.7-4.2 GHz Band in the Contiguous United States*, Public Notice, IB Docket No. 20-205 and GN Docket No. 20-305, DA 21-1157 (rel. Sept. 15, 2021).

[40] *See* Section 25.138(c) of the Commission's rules. 47 C.F.R. § 25.138(c).

[41] *See Wireless Telecommunications Bureau Opens Window For Eligible C-Band Satellite Operators To Account For Final Phase I Updates to Their Transition Plans*, Public Notice, GN Docket Nos. 18-122 and 20-173, DA 21-1100, at 5-6 (rel. Sept. 3, 2021).

to receive content on new transponder frequencies post-transition."[42] This information was estimated in SES's July 2021 Transition Plan and is further revised in Appendix C. As of the filing of this Transition Plan, the satellite operators and the Relocation Coordinator have agreed to the disposition of all Phase I Incumbent Earth Stations. The Relocation Coordinator, in discussion with the satellite operators, has (1) confirmed the satellite operator(s) the Incumbent Earth Station is associated with, (2) assigned the Incumbent Earth Station to one of the satellite operators if it was not already associated, or (3) determined the Incumbent Earth Station may no longer be receiving satellite service and so has referred it to the FCC for further action.[43] The FCC in turn has published an ex parte identifying all of the Incumbent Earth Stations that the Relocation Coordinator has referred for further FCC action.[44] If the FCC determines that one of the Incumbent Earth Stations included on the September 2021 90-Day Notice is currently receiving SES C-band services in CONUS, SES will promptly transition the earth station.

Regarding SES-affiliated Incumbent Earth Stations outside of the top 46 PEAs, SES continues to provide rough estimates based on Incumbent Earth Station information available to SES at this time. Further outreach in 2022 and 2023 will provide a much more accurate estimate and to the extent necessary, SES will file a further amended transition plan reflecting the results of the outreach. Additionally, SES continues to coordinate with the Relocation Coordinator and other satellite operators to share outreach information to further increase the accuracy of SES's estimates.[45]

SES will endeavor to repoint antennas, but this is not possible for all earth stations. For example, if a service will be transferred to another satellite, in most circumstances a new antenna will be needed rather than repointing the existing antenna as the existing antenna will continue to receive other services, either from the original satellite or other satellites operated by SES or other satellite operators. Also, repointing an antenna could create a significant service outage that may not be acceptable to an Incumbent Earth Station operator and can be avoided by installing a new antenna. Fortunately, based on the customer outreach SES has performed, SES understands that, in the vast majority of cases, an antenna is already available at the Incumbent Earth Station site to receive service from the new satellite. This expectation has been borne out in SES's Phase I clearing activities and a new antenna was needed at approximately 10% of Phase I Incumbent Earth Station sites as a result of inter-satellite service transitions. New antennas are also installed at some Incumbent Earth Stations for reasons other than inter-satellite service transitions as explained more fully below.

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[42] 47 C.F.R. § 27.1412(d)(1)(vi).

[43] Letter from Sanga Chandel, RSM US LLP, to Marlene H. Dortch, Secretary, FCC, WTB Docket No. 18-122, IB Docket Nos. 20-205 & 20-173 (filed Sept. 24, 2021) ("Relocation Coordinator Sept. 2021 Ex Parte").

[44] September 2021 90-Day Notice.

[45] In light of this ongoing outreach, it would be premature for a satellite operator to certify that it has completed both its Phase I and Phase II clearing obligations at this time.

To generate the data on which Appendix C is based, SES received feedback from and conducted considerable outreach to owners or operators of Incumbent Earth Stations, used internal databases, the FCC's IBFS database, the FCC's updated list of Incumbent Earth Stations (released September 15, 2021), engaged in extensive discussions with Intelsat and the Relocation Coordinator, and solicited feedback from customers to develop its current understanding of the universe of Incumbent Earth Stations receiving transmissions from SES satellites that will be impacted by the satellite service transitions.

When creating its initial list of associated Incumbent Earth Stations, SES threw a wide net based on the assumption it would identify Incumbent Earth Stations that were not in fact receiving SES services as transition activities progressed. Specifically, SES developed its initial list of the Incumbent Earth Station sites from customers' affiliate lists, research, and from the FCC's IBFS database. The owner/operator of each of the Incumbent Earth Stations included on the initial list has been or will be contacted by an outreach vendor initially to confirm general earth station information, such as contact details, site location information, and number of antennas accessing SES satellites at the site. A separate installation vendor then coordinates with each Incumbent Earth Station operator to determine the equipment required for the transition (antenna equipment, filters, etc.) depending on the needs of the site in accordance with the service transitions described in Appendix B and the status of the Incumbent Earth Station on the FCC's updated Incumbent Earth Station list. The installation vendor confirms the number of Incumbent Earth Stations at the site accessing SES satellites, which defines the number of passband filters that must be installed. The installation vendor determines if an additional or replacement antenna is needed for the Incumbent Earth Station to continue accessing SES's services, which may be migrated to a different SES satellite. For example, a site may only have one antenna available, but two antennas may be needed to continue downlinking the equivalent SES services post-transition.

For Incumbent Earth Stations requiring equipment (other than filters), prior to the service transition periods defined in Appendix B, SES-hired installation teams contact each SES-associated Incumbent Earth Station operator to schedule a time during which they will install the equipment. For example, SES anticipated that all MVPD Incumbent Earth Stations would be scheduled for equipment and filter installations within the last six months of the Phase I and Phase II clearing timelines because most MVPD Incumbent Earth Stations require access to several satellites and all transitions on those satellites will need to be completed before any filters are installed.[46] For Phase I, MVPD Incumbent Earth Station filtering began in May 2021 and was completed by August 31, 2021. On the other hand, some Incumbent Earth Stations, such as those that only need access to one service on one satellite, may be able to accommodate the installation of filters at any time. SES's internal communications team, through the assistance of a third-party outreach vendor, and its third-party installers working with SES customers and

[46] SES and Intelsat have already provided the multi-stakeholder technical working group (which includes Verizon) with the technical specifications of the filters that will be installed at Incumbent Earth Station sites. *See* Verizon Comments at 3 (requesting "a description of filter characteristics").

industry groups have been providing and will continue to provide Incumbent Earth Station operators, including lump sum electees, with a notification as to the overall timeframe when filter installation is expected to occur. SES anticipates that (as required by the *C-Band R&O*) each Incumbent Earth Station operator, who has not otherwise elected to accept the lump sum, will cooperate with SES to grant installers access to their facilities and equipment within the defined timeframe to ensure a smooth transition process. Should any scheduling disputes arise between SES and an associated Incumbent Earth Station Operator, the dispute will be resolved according to the dispute resolution process established by the Relocation Coordinator, as required by the *C-Band R&O*. As of the date of this Transition Plan, no scheduling disputes have arisen.

SES recognizes that some Incumbent Earth Stations may have unique characteristics or requirements, including old and obsolete facilities, and will require a customized approach to timely transition every associated Incumbent Earth Station. When the installer visits the site, the installation technician is equipped to address a number of potential scenarios, including cases where an antenna is not performing adequately when tested prior to any work that needs to be done, the inability to install a filter due to antenna mechanical issues, and antennas in hard-to-reach locations. During Phase I, this additional work may have included optimization of antenna systems by "peaking and poling" the antenna – slight adjustment to the antenna pointing and rotation of the feed to optimize polarization coherency with the polarized satellite signal, installing additional waveguide, retrofitting weather covers on feed assemblies due to fit issues with filter lengths, pointing antennas not pointed at any satellite upon request of the earth station operator, new feed assemblies, including multi-feed assemblies, retrofit of antenna elements, spare antennas to support dual illumination, reinstallation of weather cover systems, LNB replacements, general system troubleshooting activities, and others.

The *C-Band R&O* holds incumbent satellite operators individually responsible for migrating customer services out of the lower 300 MHz. At cable headends, Incumbent Earth Station operators are likely to have antennas that access multiple satellite operators, which could create logistical challenges if migration is not managed efficiently.

Given the added complexity at these earth stations, Intelsat and SES have agreed to coordinate some of the commonly required activities. Both operators have taken individual responsibility for their antenna seeding plans, for their customer compression upgrades, and for any other customer specific work required at an earth station. After the customer migrations are completed, Intelsat and SES have agreed to coordinate filter installation for Incumbent Earth Stations located at cable headends and any other Incumbent Earth Station sites that have antennas accessing both Intelsat and SES satellites. Such coordination will minimize the burden on the earth station technical staff and will reduce the risk of issues occurring during the filter installation process.

Following the installation of filters at joint sites, USSI, which is conducting transition activities for both SES and Intelsat at joint Incumbent Earth Station sites, provides feedback to SES and Intelsat on the antennas that are transitioned, and in the case of multifeed antennas, the feeds that received Intelsat or SES filters. SES and Intelsat then provide that information to the Relocation

Coordinator. The Relocation Coordinator can then identify unclaimed Incumbent Earth Station antennas or feeds.[47]

SES and Intelsat have also agreed to voluntarily install filters on any unregistered antennas located at Incumbent Earth Station sites at the same time they install filters on the collocated Incumbent Earth Stations that receive services from either SES or Intelsat satellites, provided that doing so does not impact any of SES or Intelsat's obligations under the *C-Band R&O*. The fact that SES and Intelsat will install filters on these unregistered antennas does not change their status with respect to the *C-Band R&O* and therefore, these unregistered antennas will not be eligible for interference protection from future licensed terrestrial services.[48] Furthermore, because SES and Intelsat are volunteering to take on this filtering activity, which is outside the scope of the obligations imposed by the *C-Band R&O*, the unregistered antennas subject to this agreement will not be considered part of SES's or Intelsat's accelerated clearing obligations or relevant for either operator's accelerated clearing certification. Finally, for the avoidance of doubt, SES and Intelsat will not install filters or take any responsibility for transitioning unregistered antennas that are not collocated with an Incumbent Earth Station pointed to an Intelsat or SES satellite.

SES anticipates that certain Incumbent Earth Station operators will prefer to install equipment needed for the transition on their own.[49] For such self-installations, SES requests the Incumbent Earth Station operator to notify SES in email format to Cbandhelp@ses.com. The notice must specify if the Incumbent Earth Station operator plans to (1) procure equipment on its own, and therefore will be seeking reimbursement directly through the Relocation Payment Clearinghouse rather than looking to SES to cover the cost of the equipment, or (2) request SES-provided equipment and provide SES with a list of the equipment that is required for each Incumbent Earth Station.[50] SES expects most Incumbent Earth Station operators to request SES-provided equipment, but this is a choice each Incumbent Earth Station operator can make. The notice

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[47] The complicated situation involving transitioning individual feeds on multifeed antennas further illustrates why a satellite operator cannot certify that it has completed both its Phase I and Phase II clearing obligations at this time.

[48] *C-Band R&O* ¶ 123. *But see Incumbent Earth Stations in the 3.7-4.2 GHz Band in the Contiguous United States*, Order, IB Docket No. 20-205 & GN Docket No. 20-305, DA 20-1258 (rel. Oct. 23, 2020) (granting limited waiver requests from several Incumbent Earth Station operators seeking to register additional, existing co-located antennas for the purposes of interference protection in the 4.0-4.2 GHz portion of the band).

[49] These self-install Incumbent Earth Station operators are not the ones electing to receive a lump sum payment – SES will have no obligations with regard to the operators electing the lump sum payment beyond providing necessary equipment where a technology upgrade is required and responding to the elected earth station operator's request to coordinate with SES, as necessary. SES will provide support to self-install Incumbent Earth Station operators, as discussed herein.

[50] SES will provide equipment only for Incumbent Earth Stations receiving service from an SES satellite.

must also provide a detailed listing of the equipment needed for each physical Incumbent Earth Station identified in the FCC's updated Incumbent Earth Station list receiving service from an SES satellite. SES will review these details to determine the eligibility for reimbursement of the equipment prior to ordering and shipping the equipment to the Incumbent Earth Station operator's location.

For Incumbent Earth Station operators choosing to self-install equipment, SES provides the timeline within which the dual illumination of all affected services, if any, will occur and when the equipment must be installed. Upon receipt of the necessary equipment by the Incumbent Earth Station operator, SES provides the Incumbent Earth Station operator remote assistance via SES's help desk as needed to support the installation.

SES is not responsible for the quality of equipment purchased by the Incumbent Earth Station operator or the workmanship of the self-installation. Appendix C identifies the Incumbent Earth Stations that have notified SES of their intent to self-install SES-provided equipment or their directly purchased equipment. As of the date of this amended Transition Plan, 38 Phase I Incumbent Earth Station operators have chosen to self-install their C-band equipment.

The amended Appendix C attached to this Transition Plan reflects the status of each Incumbent Earth Station included in the Appendix C submitted with our July 2021 Transition Plan. For Phase I Incumbent Earth Station records that were removed, an explanation for that decision is provided. SES has provided the Relocation Coordinator a list of all Phase I Incumbent Earth Stations it removed from Appendix C since its July 2021 Transition Plan. As discussed above, the Relocation Coordinator works with the other satellite operators and the Incumbent Earth Station operator to confirm if these and other unclaimed Incumbent Earth Stations remain operational, and if so, the associated satellite operator. An Incumbent Earth Station is only an associated Incumbent Earth Station if it is: (i) currently operational, *i.e.*, not decommissioned; (ii) receiving a C-band satellite service from SES; and (iii) responsive to a satellite operator's[51] or Relocation Coordinator's outreach. In the event an Incumbent Earth Station is determined to be decommissioned, not receiving any C-band satellite service or the operator is not responsive to any outreach attempts, the Relocation Coordinator informs the FCC for the Commission's further action.[52] When a steerable antenna to be used as needed for short-term access to any satellite within its range of motion is identified, the Relocation Coordinator will assign the unclaimed Incumbent Earth Station to one of the satellite operators for transitioning.

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[51] SES or its designated third parties (*e.g.*, installers) makes numerous attempts via telephone and email to reach the non-responsive Incumbent Earth Station operator. If those attempts fail, SES will reach out to various industry stakeholders (e.g., ACA Connects in the case of a non-responsive MVPD operator) for assistance as well as the regulatory point-of-contact for the non-responsive Incumbent Earth Station operator as set forth in the respective IBFS filing application. If these subsequent attempts fail, SES then informs the Relocation Coordinator for their further action.

[52] Relocation Coordinator Sept. 2021 Ex Parte.

As part of SES's election to clear on an accelerated basis, SES has committed "to take responsibility for relocating its associated incumbent earth stations" by the accelerated relocation deadlines.[53] Associated Incumbent Earth Station operators accordingly must "facilitate" SES's completion of earth station relocation, including "by helping with scheduling, providing access to facilities, and confirming the work performed."[54] As of the date of this Transition Plan, SES has cleared its Phase I associated Incumbent Earth Stations and those assigned to SES by the Relocation Coordinator.

If SES learns of any potential earth station transition delays, as contemplated by the *C-Band R&O,* SES intends to work expeditiously with the Incumbent Earth Station operator, Relocation Coordinator, and the Bureau to resolve such issues consistent with SES's Transition Plan, including its transition timeline. SES also intends to timely inform the Bureau of any "earth station transition delays" that are beyond SES's control.[55]

F. Gateway and TT&C Transition

The *C-Band R&O* requires SES to identify two of the four protected TT&C locations in its transition plan.[56] For the avoidance of doubt, SES has selected the Hawley and Brewster sites as its two protected TT&C locations.

SES will supplement its TT&C services to support the new and existing satellites in compliance with the FCC clearing requirements. To that end, SES is enhancing the capabilities at Hawley and Brewster to support the testing and operations of SES's North America fleet utilizing C-band. To accomplish these requirements, SES is installing full-motion antennas and associated satellite ground control equipment at each location. Once the new full-motion antennas are installed and tested, SES will no longer receive TT&C signals below 4.0 GHz at any CONUS location other than Hawley and Brewster, which are permitted by the *C-Band R&O* to receive TT&C signals below 4.0 GHz on a protected basis. As of the date of this Transition Plan, TT&C operations previously conducted in the lower 120 MHz of C-band spectrum have either been transitioned to the upper frequencies on the satellites or the ground stations receiving the signals in the lower portion of the band have been transitioned to the SES Brewster or Hawley TT&C/Gateway locations. SES will continue to use its existing teleports to receive signals in the 4.0-4.2 GHz band.

SES will also relocate downlink services associated with international video feeds, data and other services that cannot be transitioned out of the 3.7-4.0 GHz band to the Hawley and Brewster

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[53] *C-Band R&O* ¶ 292.

[54] *Id*.

[55] *Id.* ¶ 294.

[56] *Id.* ¶ 374 ("Should the incumbent space station operators fail to come to consensus, we expect that SES would identify two locations and Intelsat would identify the other two locations.").

sites.[57] These services cannot be transitioned into the upper 200 MHz of C-band spectrum for one of several reasons. One overarching issue is the lack of available capacity in the upper 200 MHz once all of the CONUS services are transitioned.[58] Also, it may not be possible to transition the uplink frequency due to other local regulatory factors such as coordination with terrestrial fixed services in the 6 GHz band (when the service has an uplink paired with the downlink below 4.0 GHz) or technical restrictions in the uplink equipment itself.

Consistent with the *C-Band R&O*, SES intends to receive signals in the 3.7-4.0 GHz band on an unprotected basis at the TT&C Gateway sites.[59] The transition of such signals will follow one of two approaches. International video feeds and some of the data service downlinks will be transitioned simply by installing antennas and IRDs or other equipment at the TT&C/Gateway sites to receive the signals in the current frequency from the current satellite. The received signals will then be delivered to current customer downlink locations via terrestrial means. Other data services that operate through a VSAT-type managed platform will be migrated in whole (*i.e.*, the platform itself will be relocated to the Hawley or Brewster sites) and the two-way data service will be interconnected via terrestrial means with existing customer hub locations.

As part of the services it provides, SES monitors the C-band signals it provides and maintains geolocation solutions to identify potential interference from its teleports in Woodbine, MD, and Manassas, VA. These services require the ability to receive the same signal that is being provided for the customer. Therefore, monitoring and geolocation operations associated with the services described in the preceding paragraph must be moved to Hawley and Brewster so they can continue on an unprotected basis. Geolocation services must be maintained and continued for both existing and new C-Band satellites, as well as satellites with C/Ku cross strapped payloads, and as such SES must build two new C/Ku-band steerable antennas at Hawley with associated hardware/software.

As previously reported, the TT&C antenna installations, along with the associated ground equipment, and transition services are underway at both Brewster and Hawley. All services operating below 3.82 GHz have been transitioned. The remaining services are expected to be completed well in advance of the Phase II clearing deadline.

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[57] *Id.* at n.826 ("[The Commission] expect[s] that all incumbent space station operators will have the opportunity to co-locate their TT&C and international gateways at [consolidated TT&C/Gateway sites].").

[58] *See* Letter from Bill Tolpegin, Chief Executive Officer, C-Band Alliance, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 18-122, at 8 (filed Jan. 14, 2020) ("[Consolidated TT&C/Gateway] sites are critical . . . because they serve as gateways (or ingest points) for a significant amount of customer services that must maintain access to the entire 500 MHz of the FSS C-band downlink band.").

[59] *C-Band R&O* ¶ 380.

II. Reporting and Certification of Clearance

SES anticipates filing its Phase I Certification of Accelerated Relocation in the near term confirming that the relevant Phase I Incumbent Earth Stations have been transitioned. SES will file a similar certification once all Phase II activities are completed.

III. Timeline (§ 27.1412(d)(1)(vii))

The full scope of the service transitions described above and in Appendix B are reflected in the timeline provided in Appendix E. The timeline is a high-level description of all of the many complex and time-consuming activities SES has or will complete to meet the accelerated relocation deadlines and reflects the extensive discussions SES held with customers and other C-band stakeholders. Customers and associated Incumbent Earth Station operators should refer to the transition times associated with their specific services in Appendix B to understand when they and their affiliates will be subject to dual illumination and any equipment changes.

A more detailed description of each element of the timeline is provided below.

Transitions: During the time periods designated for "Transition" in the Appendix E timeline, SES will perform all necessary activities to migrate services on its satellites and install all necessary equipment resulting from the satellite service migrations at affected Incumbent Earth Stations and install requisite passband filters. In some cases, services that are affected by the Phase II deadline were transitioned during the Phase I period to improve efficiencies and reduce the impact on Incumbent Earth Station operators. As noted previously, given the fluidity of these transition activities and the ongoing efforts to identify and allocate all associated Incumbent Earth Stations, it is premature for any satellite operator to certify that it has completed both its Phase I and Phase II clearing obligations at this time.

Technology Upgrades: As described in Section I.D, SES has worked with one of its customers receiving a compression/modulation technology upgrade to install encoding, statistical multiplexing, modulators and other equipment at the customer's uplink sites while simultaneously installing IRDs, multiplexing and other equipment at the associated Incumbent Earth Stations. The number of associated Incumbent Earth Stations receiving IRDs is higher than the number of associated Incumbent Earth Stations reflected in Appendix C because SES is responsible for providing IRDs to any Incumbent Earth Station operator that has elected to take the lump sum but has indicated its intent to continue C-band service. For other technology upgrades described in Section I.D (other than platform migrations), SES has and will continue to work with affected customers to assess the most efficient method for effectuating upgrades, including identifying specific equipment requirements such as demodulators, networking equipment and terrestrial service requirements to allow customer downlinks to be migrated to Hawley or Brewster and delivered via terrestrial means to current customer downlink locations. The compression/modulation technology upgrade for services occupying Phase I and frequencies has been completed as of the date of this Transition Plan. The remaining services are expected to be completed by October 31, 2021.

Platform Migrations: Platform migrations as described in Section I.D are complex and time-consuming, and as such, will be performed over an extended period. As an individual platform may carry services that require transition over both Phase I and Phase II, necessary upgrades such as line cards will be installed in stages such that prioritization was given to services that had to be migrated in Phase I.

Filter Installations: For all associated Incumbent Earth Stations, once all of the services received by the antenna are transitioned to their final frequencies, polarizations, or satellites, SES or the Incumbent Earth Station operator can install a passband filter. As of the date of this amended Transition Plan, SES has installed filters at 100% of the Phase I Incumbent Earth Station sites. SES has continued to build up filter inventory for all Phase II activities during the reporting period and has conducted outreach calls with, or visits to, approximately 400 Phase II Incumbent Earth Station sites and has commenced filter installation at a small number of Phase II sites.

Gateway Migrations: The gateway migrations consist of installing downlink equipment at the Hawley and Brewster sites to access all satellites shown in Appendix A. The gateway and teleport equipment and facilities for Phase I customer transitions are complete as of the date of this Transition Plan, and those needed for Phase II customer transitions are expected to be completed no later than August 31, 2023.

Satellite Procurement: SES has entered into manufacturing contracts to build a total of four satellites and two ground spares necessary to effectuate the transition according to the Commission's aggressive timetable. The initial four satellites are scheduled to be launched by the end of Q3 2022. SES has also entered into launch service agreements to support the launch of the four satellites. As discussed above, SES must undertake dual launches. However, some additional launch reservations will be purchased for contingency to address potential manufacturing delays or launch failures.

Service Migrations: SES anticipates it will take two to four months after the satellites are launched to raise the satellites to their testing orbit locations, complete testing, move the satellites to their final orbital locations, and initiate service on the satellites.

IV. Estimated Costs

Appendix D provides the estimated costs associated with the Transition Plan described herein. There are no changes to the estimated costs relative to the amounts included in the July 2021 Transition Plan. SES continues to be responsible for providing IRDs to any associated Incumbent Earth Station that is receiving service from the SES customer implementing compression irrespective of whether the associated Incumbent Earth Station is subject to an accepted lump sum election.

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Appendix A

Authorized Space Stations Subject to Transition

The table below details the SES satellites on the list of space stations licensed under Part 25 of the Commission's regulations or granted access to the U.S. market pursuant to Section 25.137 of the Commission's rules that can carry services impacted by the transition.

Space Station	Call Sign	Orbital Location (Deg. W.L.)	Station-kept (SK) / Inclined (I)	Services impacted?
NSS-7	S2463	20	I	
SES-4	S2828	22	SK	Y
NSS-10	S2415	37.45	I	Y
SES-6	S2870	40.5	SK	Y
SES-14	S2974	47.5	SK	Y
AMC-3	S2162	72	I	Y
AMC-6	S2347	139	SK	
SES-2	S2826	87	SK	Y
SES-1	S2807	101	SK	Y
SES-3	S2892	103	SK	Y
SES-11	S2964	104.95	SK	Y
AMC-11	S2433	131	SK	Y
AMC-4	S2135	134.9	I	
AMC-8	S2379	135	I	
AMC-18	S2713	83	SK	
NSS-9	S2756	176.93	SK	Y

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Appendix B

Plan to Migrate Existing Services

This appendix provides a description of the accompanying MS Excel file that details the services that will be impacted by the SES Transition Plan. The format of the Appendix B Excel File is described in the MS Excel file, along with a description of each field. Services not requiring relocation above 4.0 GHz are not included in the Appendix B Excel File. As discussed above, SES has continued to refine its plan through discussions with customers and additional internal review since the initial plan was filed on June 19, 2020. As a result, a number of changes have been made to the Appendix B Excel file submitted in the July 2021 Transition Plan.

SES offers service through its SES Government Solutions subsidiary to Raytheon Technologies, which operates an FAA / WAAS system at the SES South Mountain TT&C/Gateway location in Somis, CA. The service included reception of the lower TT&C frequency which required a transition from C-band to Ka-band to allow for continued satellite tracking post-transition through the addition of a Ka-band sidecar antenna and feed assembly on the WAAS antenna at the Somis, CA location. The antenna upgrade and transition was completed as of August 31, 2021 at which time the C-band TT&C signal no longer was received by the WAAS antenna.

As SES has previously stated, prior to the planned transition, SES has been able to serve the needs of occasional use ("OU") operators by making available transponders that are idle for a short period of time in the scope of full-time customer migrations.[60] The market for OU services is relatively small and on a downward turn in light of market forces and increased reliance on fiber-based services. As such, SES's ability to continue to provide OU services will not be impacted by its transition of other services. The availability of short-term idle transponders will not be impacted by the transition and SES will continue to make transponders that are temporarily available for OU use after the transition is complete just as it did before the transition.[61] In other words, the transition will have no impact on the extent or availability of idle transponders for OU service.

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[60] *See* Letter from Brian D. Weimer, Counsel for SES, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 18-122 (filed June 17, 2020).

[61] *Id*.

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Appendix C

This appendix provides a description of the accompanying MS Excel file that details the Incumbent Earth Stations that currently receive services[62] from SES satellites. Using the FCC's September 15, 2021 Incumbent Earth Station list, SES removed any prior claims that (i) no longer appear on the Incumbent Earth Station list, (ii) are Incumbent Earth Stations that are subject to an accepted lump sum election, (iii) were previously claimed to be associated with an SES satellite but have been deemed subsequently not to be associated with an SES satellite or (iv) have been referred by the Relocation Coordinator to the FCC for further action. Therefore, the Appendix C Excel file contains only Incumbent Earth Stations that (1) we have affirmatively determined to be associated with an SES satellite through our outreach efforts, (2) we believe may be associated with an SES satellite or (3) were assigned to SES by the Relocation Coordinator. With respect to item (2), which is particularly relevant for any Incumbent Earth Station outside of the top 46 PEAs, additional outreach will validate whether the Incumbent Earth Station does in fact receive services from an SES satellite. Since its July 2021 Transition Plan was filed, SES independently and through its installers have identified 46 Incumbent Earth Station records that have been added to SES's Transition Plan and 63 Incumbent Earth Station records that are not receiving any services from an SES satellite. Appendix C incorporates this information and provides further explanation for each record that has been removed since SES's July 2021 Transition Plan. Appendix C also reflects SES-associated feeds on multi-feed antennas as has been validated by SES and its third-party installers during the filter installation process.

The format of the Appendix C Excel File is described in the MS Excel file, along with a description of each field. Note that one Incumbent Earth Station associated with SES, identified as ESID 15478 in the Appendix C Excel File, has informed SES that it does not plan to continue C-band services at that location and therefore has refused filter installation or other transition services from SES. Additionally, we are aware that one Incumbent Earth Station, identified in Appendix C as ESID 11871, mistakenly filed its lump sum election in the wrong docket. The Relocation Coordinator has informed us that the FCC will accept this Incumbent Earth Station's lump sum election and the Incumbent Earth Station will be designated as a lump sum electee. Consequently, the earth station operator has refused filter installation by SES, and SES will no longer include the Incumbent Earth Station in its Transition Plan.[63] Also, one Incumbent Earth Station operator has informed SES of an error in their filing where both the geographical coordinates and the street address in the filing were incorrect. There are no C-band antennas

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[62] A service is defined as a contracted continuous bandwidth segment on an SES satellite as set forth in Appendix B. If sufficient details were not provided by the SES customer, it is assumed that an Incumbent Earth Station receives all services provided by a particular SES customer.

[63] *See C-Band R&O* ¶ 293 (noting that space station operators have no obligations with regard to associated lump sum electees beyond providing necessary equipment where a technology upgrade is required and responding to the lump sum electees request to coordinate).

located at the filed address / geographical location. The associated Incumbent Earth Stations are identified as ESIDs 13347 and 13348 in the Appendix C Excel File Change Log tab.

As reported in our June 28, 2021 Quarterly Report, on June 18, 2021, SES and PSSI Global Services, LLC, filed a joint letter with the FCC confirming they had executed a binding agreement whereby PSSI will undertake all duties and responsibilities to timely transition the six PSSI earth station antennas that the Relocation Coordinator assigned to SES on May 6, 2021.[64] The six PSSI earth station antennas were not reflected in SES's July 2021 Transition Plan. Although PSSI has agreed to take full responsibility to transition those earth station antennas, SES has included them in Attachment C to ensure they are accounted for.

[64] *See* Joint Letter from Brian Weimer, counsel to SES Americom, Inc., and Stephen Diaz Gavin, counsel to PSSI Global Services, LLC, filed in GN Docket Nos. 18-122 & 20-173 (filed June 18, 2021).

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Appendix D

Estimated Costs

Category	Total
Satellite replacement program (total estimated cost)	$1,329,000,000
• Satellites (6 satellites)	$869,000,000
• Launches (2 dual launches + 2 single launches)[65]	$340,000,000
• Satellite ground control and TT&C systems, program management and insurance	$120,000,000
Filters and LNBs[66]	$57,065,000
Antennas[67]	$12,995,000
Dual Illumination	$7,000,000
Other Services[68]	$5,650,000
Technology Upgrades	$133,000,000[69]
TT&C / Gateway Consolidation	$56,000,000
Other[70]	$16,000,000
Total	**$1,616,710,000**

[65] SES's transition plan assumes two dual-launches and two single-launches for launch risk mitigation.

[66] Includes installation.

[67] *Id*.

[68] Includes outreach, data collection, data analysis, stakeholder communications, technical consulting, and installation help desk.

[69] This estimate has not changed from SES's August 14, 2020 plan because SES remains responsible for supplying IRDs to all Incumbent Earth Stations that receive content from SES's compression customer irrespective of whether the Incumbent Earth Station is subject to an accepted lump sum election.

[70] Includes legal, communications, Relocation Coordinator, Clearinghouse, etc.

These estimated costs reflect specific costs that are determined from contracts SES has already entered into as well as estimated costs for hardware and services that have not yet been purchased.

The satellite procurement estimates relate to the information provided in Section I.B above. The costs for four satellites plus two ground spares are based on manufacturing contracts. Similarly, the launch costs reflect the contracted cost for two dual-launches and a single contingency launch if the first of the two ground spares must be launched. A second single launch may be needed in the event the second ground spare must be launched, and the estimated cost of that launch is included. In the event of launch failures, the incremental insurance costs are not reflected above, and reimbursement will only be sought if such costs are incurred.

The costs identified for filters and LNBs, antennas, dual illumination, and other services reflect the activities described in Sections I.C and I.E above. SES has entered into agreements with a number of the suppliers and has utilized the referenced estimates from the equipment and services RFPs in forming the projected cost structure. The technology upgrade costs reflect the activities described in Section I.D and the TT&C and gateway upgrade costs relate to the activities described in Section I.F.

The internal manpower and financing charges associated with the specific categories described above has been incorporated into the specific related category.

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Appendix E

Transition Timeline

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The following represent SES's overall transition timeline. Required individual customer transition schedules are referenced in Appendix B and are subject to adjustment as required by SES.