



PUBLIC NOTICE

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445 12th St., S.W.
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WIRELESS TELECOMMUNICATIONS BUREAU RELEASES FINAL COST CATEGORY SCHEDULE FOR 3.7-4.2 GHZ BAND RELOCATION EXPENSES AND ANNOUNCES PROCESS AND DEADLINE FOR LUMP SUM ELECTIONS

GN Docket No. 18-122; IB Docket No. 20-205

Lump Sum Elections Due: August 31, 2020

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I. INTRODUCTION

1. With this Public Notice, the Wireless Telecommunications Bureau (the Bureau) releases the attached 3.7 GHz Transition Final Cost Category Schedule of Potential Expenses and Estimated Costs (Cost Catalog). The Bureau also releases the optional lump sum payment amounts for which incumbent Fixed Satellite Service (FSS) earth station operators are eligible and announces the process and deadline for electing to receive lump sum payments.

2. In the *3.7 GHz Report and Order*, the Commission adopted rules to make 280 megahertz of mid-band spectrum available for flexible use (plus a 20 megahertz guard band) throughout the contiguous United States by transitioning existing services out of the lower portion of the band and into

the upper 200 megahertz of the 3.7-4.2 GHz band (C-band).¹ The *3.7 GHz Report and Order* established that new 3.7 GHz Service licensees will reimburse the reasonable relocation costs of eligible FSS space station operators, incumbent FSS earth station operators, and incumbent Fixed Service licensees (collectively incumbents) to transition out of the band.² To provide incumbents and new 3.7 GHz Service licensees with a range of reasonable transition costs, the *3.7 GHz Report and Order* directed the Bureau to establish a cost category schedule of the types of expenses that incumbents are likely to incur.³ The *3.7 GHz Report and Order* provided for the creation of a Relocation Payment Clearinghouse (Clearinghouse) to oversee the cost-related aspects of the transition, including collecting relocation payments from overlay licensees and disbursing those payments to incumbents.⁴ In determining the reasonableness of costs for which incumbents seek reimbursement, the *3.7 GHz Report and Order* provided that the Clearinghouse would presume as reasonable all submissions that fall within the estimated range of costs in the final cost category schedule.⁵ Incumbent earth station operators, satellite operators, and Fixed Service licensees are not precluded, however, from obtaining reimbursement for their actual costs that exceed the amounts in the Cost Catalog, so long as those costs are reasonably necessary to the transition, and incumbents provide justification to the Clearinghouse.⁶

3. The *3.7 GHz Report and Order* also established that incumbent FSS earth station operators may accept either: (1) reimbursement for their actual reasonable relocation costs to maintain satellite reception; or (2) a lump sum reimbursement “based on the average, estimated costs of relocating all of their incumbent earth stations” to the upper 200 megahertz of the C-band.⁷ The *3.7 GHz Report and Order* directed the Bureau to “announce the lump sum that will be available per incumbent earth station as well as the process for electing lump sum payments” and provided that the Bureau should identify

¹ *Expanding Flexible Use of the 3.7 to 4.2 GHz Band*, GN Docket No. 18-122, Report and Order and Order of Proposed Modification, 35 FCC Rcd 2343, 2345, para. 4 (2020) (*3.7 GHz Report and Order*).

² *Id.* at 2391, 2465-66, paras. 111, 326; 47 CFR § 27.4. The *3.7 GHz Band Report and Order* defines the incumbents that will be eligible to be reimbursed for their reasonable relocation costs. *See id.* at 2426, para. 200 (defining an eligible space station operator as “an incumbent space station operator” that “must have demonstrated, no later than February 1, 2020, that it has an existing relationship to provide service via C-band satellite transmission to one or more incumbent earth stations in the contiguous United States”); 47 CFR § 27.1411(b)(1)-(2) (defining eligible space station operators and incumbent space station operators); *3.7 GHz Report and Order*, 35 FCC Rcd at 2392, para. 116 (defining incumbent earth stations as those Fixed Satellite Service earth stations that: “(1) were operational as of April 19, 2018; (2) are licensed or registered (or had a pending application for license or registration) in the IBFS database as of November 7, 2018; and (3) have timely certified, to the extent required by the Order adopted in FCC 18-91 (as we clarify . . . to include certain renewal applications and license and registration applications filed through November 7, 2018), the accuracy of information on file with the Commission”); 47 CFR § 27.1411(b)(3) (defining incumbent earth stations); *3.7 GHz Report and Order*, 35 FCC Rcd at 2465, para. 326 (defining incumbent Fixed Service licensees as “[i]ncumbent licensees of point-to-point Fixed Service links that relocate out of the 3.7-4.2 GHz band by December 5, 2023”). The *3.7 GHz Band Report and Order* provides limited instances in which earth stations outside of the contiguous United States are eligible for reimbursement. *See id.* at 2428, para. 204 (providing for reimbursement for expenses of earth stations located outside of the contiguous United States to the extent it can be demonstrated that the system modifications for which reimbursement is sought is a direct result of the C-band transition). The process by which costs will be determined to be reimbursable is defined in 47 CFR § 25.1416.

³ *See 3.7 GHz Report and Order*, 35 FCC Rcd at 2448, para. 262 (directing Wireless Telecommunications Bureau to approve a cost category schedule); 47 CFR § 27.1416(a).

⁴ *3.7 GHz Report and Order*, 35 FCC Rcd at 2446, para. 255.

⁵ *Id.* at 2448, para. 262; 47 CFR § 27.1416(a).

⁶ *See 3.7 GHz Report and Order*, 35 FCC Rcd at 2447-48, paras. 260-62.

⁷ *Id.* at 2427-28, paras. 202-203. *But see id.* at 2428, para. 204, n.550 (noting that “incumbent earth stations owners may not elect a lump sum payment for earth stations outside of the contiguous United States”).

lump sum amounts for various classes of earth stations as appropriate.⁸

4. The Commission engaged a third-party contractor, RKF Engineering Solutions, LLC (RKF), to assist in identifying the costs that incumbents might incur, developing a cost category schedule, and calculating the lump sum payment amounts. To compile the information needed to develop a cost catalog, RKF considered the *3.7 GHz Report and Order*'s initial relocation cost estimates, derived from comments and filings in the record,⁹ and it then conducted confidential interviews with a broad range of stakeholders, including satellite operators, earth station operators, Fixed Service licensees, and vendors.¹⁰ With input from RKF, the Bureau developed a preliminary cost catalog, which it released for public comment.¹¹ The preliminary cost catalog included classes of earth stations for which the Bureau would establish lump sum payments. After review of the record, the Bureau issued a public notice seeking further comment on a revised list of earth station classes, preliminary lump sum payment amounts, and the methodology for calculating those amounts.¹² After considering the comments in response to the *Cost Catalog Comment Public Notice* and the *Lump Sum Comment Public Notice*,¹³ the Bureau now releases the final Cost Catalog and lump sum payment amounts.

II. FINAL COST CATALOG

5. The attached Cost Catalog contains the categories and estimates of expenses that incumbents may incur as they clear FSS operations from the 3.7-4.0 GHz portion of the band and Fixed Service operations from the entire C-band to make the lower 280 megahertz available for flexible use. In the final Cost Catalog, we review and incorporate, as appropriate, the information we received from commenters in response to the preliminary cost catalog.

A. Clarifications on the Use of the Cost Catalog for Reimbursement

6. In response to the *Cost Catalog Comment Public Notice* and the *Lump Sum Comment Public Notice*, commenters sought clarification and additional information on how reimbursement payments and lump sum amounts should be counted and on how to use the Cost Catalog.¹⁴ We clarify

⁸ See *3.7 GHz Report and Order*, 35 FCC Rcd at 2428, para. 203.

⁹ See *id.* at 2428-30, 2465-66, paras. 206-10, 326-27.

¹⁰ See *Wireless Telecommunications Bureau Seeks Comment on Preliminary Cost Category Schedule for 3.7-4.2 GHz Band Relocation Expenses*, GN Docket No. 18-122, Public Notice, 35 FCC Rcd 4440, 4441 (WTB 2020) (*Cost Catalog Comment Public Notice*).

¹¹ *Cost Catalog Comment Public Notice*, Attach., 35 FCC Rcd at 4444 (3.7 GHz Transition Preliminary Cost Category Schedule of Potential Expenses and Estimated Costs).

¹² *Wireless Telecommunications Bureau Seeks Comment on Optional Lump Sum Payments for 3.7-4.2 GHz Band Incumbent Earth Station Relocation*, Public Notice, DA 20-586, at 1-5 (WTB June 4, 2020) (*Lump Sum Comment Public Notice*).

¹³ To the extent relevant, the Bureau also has considered the preliminary Transition Plans filed by eligible satellite operators in assessing reasonable costs and lump sum amounts for the Cost Catalog. See, e.g., Letter from Michelle V. Bryan, Secretary, Intelsat License LLC, and Executive Vice President, General Counsel, and Chief Administrative Officer, Intelsat US LLC (Intelsat), to Marlene H. Dortch, Secretary, FCC, GN Docket Nos. 18-122 and 20-173, Attach. (filed June 19, 2020) (Intelsat Transition Plan); Letter from Brian D. Weimer, Counsel to SES Americom, Inc. (SES), to Marlene H. Dortch, Secretary, FCC, GN Docket Nos. 18-122 and 20-173, Attach. (filed June 19, 2020) (SES Transition Plan).

¹⁴ See, e.g., Intelsat May 14, 2020 Comments at 9 (asking for clarification that the lump sum will be calculated on a per earth station type basis); *id.* at 13 (asking for clarification that a cost value applies per integrated receiver/decoder or modem, not per transponder); NCTA – The Internet & Television Association (NCTA) May 14, 2020 Comments at 13 (asking for clarification that parties can seek reimbursement for actual transition costs from

(continued....)

certain aspects of the Cost Catalog. First, the costs included in the Cost Catalog are on a per unit basis (e.g., per earth station antenna or dish) unless the catalog specifies otherwise.¹⁵ For example, while an earth station registration listed in the International Bureau Filing System (IBFS) may incorporate more than one antenna or dish, we clarify that only those antennas that are identified under an incumbent earth station registration, consistent with the requirements set forth in the *3.7 GHz Report and Order*,¹⁶ can count as a unit towards the calculation of reimbursable expenses.¹⁷ Calculating costs on a per unit basis most closely reflects the actual mechanism of the transition, much of which will require changes, upgrades, and/or modifications to individual antennas. We note that the references in the preliminary cost catalog and in the *Lump Sum Comment Public Notice* to “per earth station” referred to individual antennas specifically identified and included within an IBFS registration.¹⁸ We have updated references in the Cost Catalog to clarify where we refer to an individual antenna and to clarify that the lump sum base payments in Table III-E-1 (Lump Sum Table) are calculated *per antenna* rather than per earth station registration or site.¹⁹ Incumbents with more than one antenna registered per site may be eligible for reimbursement for multiple units associated with the same IBFS registration, where the Clearinghouse finds the expenses are

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anywhere in the catalog and not specific tables); *id.* at 13-15 (arguing that catalog should specify the units in which costs will apply and that multiple units can be sought where needed).

¹⁵ See NCTA May 14, 2020 Comments at 13-14 (asking Bureau to clarify that costs are per unit).

¹⁶ See *3.7 GHz Report and Order*, 35 FCC Rcd at 2426, para. 201, n. 539 (“Consistent with our definition of ‘incumbent earth stations,’ we clarify that, in order to qualify for reimbursement, any antenna at an incumbent earth station must also have been operational and registered in IBFS as of the relevant dates required by the *Freeze and 90-Day Earth Station Filing Window Public Notice*.”). To qualify for reimbursement, incumbent earth stations must have met the following qualifications: (1) Operational as of April 18, 2018 filing freeze and remain operational; and registered (receive-only) or licensed (transmit/receive) in the 3700-4200 MHz band; (2) If unregistered or unlicensed before April 18, 2018, registration or license applications must have been filed by November 7, 2018; (3) If registered or licensed before April 18, 2018, the registrant or licensee must have: (a) Certified the accuracy of the registration/license information in the International Bureau Filing System (IBFS) by May 28, 2019; (b) Filed a modification/update to the registration or license in IBFS during the April 19, 2018 – November 7, 2018 filing window; or (c) Filed a timely renewal application for the existing registration or license by May 28, 2019. *3.7 GHz Report and Order*, 35 FCC Rcd at 2392, para. 116; 47 CFR § 27.1411(b)(3) (defining incumbent earth stations); 47 CFR § 25.121 (earth station renewal requirements). In addition, an earth station must maintain a current authorization in IBFS.

¹⁷ The International Bureau has released a Public Notice which reflects the information currently available in IBFS for incumbent earth stations, including the number of antennas at each site. The International Bureau sought comment from stakeholders to ensure the accuracy of the list prior to the time for lump sum elections. *International Bureau Releases Preliminary List of Incumbent Earth Stations in the 3.7-4.2 GHz Band in the Contiguous United States*, IB Docket No. 20-205, Public Notice, DA 20-703, at 1-2 (IB July 6, 2020).

¹⁸ See, e.g., *Lump Sum Comment Public Notice* at 4-5. For example, commenters have indicated confusion about whether the lump sum amounts in the *Lump Sum Comment Public Notice* apply per antenna or per earth station. See, e.g., ACA Connects – America’s Communications Association (ACA) June 15, 2020 Comments at 7 (raising concern that the *Lump Sum Comment Public Notice* was “vague with respect to the definitions of the proposed base lump sum categories, and whether they should apply on a per antenna or per earth station basis”); NCTA June 15, 2020 Comments at 5 (arguing that the proposed amounts “per earth station” are too low to reflect transition costs). With respect to our prior use of “per earth station” to refer to “per antenna,” we note that the rules adopted in the *3.7 GHz Report and Order* support such an approach. Section 27.1411(b)(5), for example, says that “[a] passband filter must be installed at the site of *each incumbent earth station*.” 47 CFR § 27.1411(b)(5) (emphasis added). The only logical reading of this language is that “incumbent earth station” refers to an individual antenna, rather than a site with multiple antennas, as passband filters are necessary for each antenna.

¹⁹ As discussed in more detail in section II below, this applies to the “Base Lump Sum Payments,” but does not apply to the “MVPD Per Site Technology Upgrade Installation Lump Sum Payment.”

reasonable and necessary to the relocation.²⁰ Similarly, incumbent earth station operators that elect the lump sum will be eligible to receive the base lump sum payments identified in the Lump Sum Table for each operational and registered antenna included in an IBFS registration for an incumbent earth station site.²¹ Thus, a registered earth station site that includes four registered antennas can claim a base lump sum payment for each antenna.²²

7. We also clarify that incumbents that do not elect the lump sum are not limited to reimbursement from the costs listed in a particular table or for a particular type of earth station or antenna; they may incur costs from different tables if needed to address their particular transition.²³ For example, an earth station that is being repointed to a new satellite using costs in Table III-A-2 also may need the installation of a reflector antenna from Table III-B-2 in order to view the new satellite. Accordingly, incumbents will need to determine those costs that are necessary to perform the transition to maintain an equivalent level of service and to provide the itemized details to the Clearinghouse so it can determine whether those costs are reasonable.

8. In addition, we remind incumbents that they must acquire “equipment that most closely replaces their existing equipment or, as needed, provides the targeted technology upgrades necessary for clearing the lower 300 megahertz, and all relocation costs must be reasonable.”²⁴ As the *3.7 GHz Report and Order* makes clear, incumbents may not attempt to claim reimbursement to enhance or upgrade their service or to replace older equipment capable of being transitioned beyond what is “reasonably necessary to complete the transition in a timely manner.”²⁵ Accordingly, we make clear that inclusion of a category or cost item in the Cost Catalog does not mean, as a matter of course, that such expense would be reasonable in all transitions. Incumbents are eligible to be reimbursed only for those expenses that are reasonably necessary to complete the transition.²⁶ Not all expenses in the Cost Catalog (such as equipment replacement) will be necessary in every type of transition. Finally, while the Cost Catalog includes certain recurring costs, such as rental equipment or recurring fees, incumbents are only permitted

²⁰ See *3.7 GHz Report and Order*, 35 FCC Rcd at 2422, para. 194 (defining reasonable relocation costs); NCTA May 14, 2020 Comments at 15 (asking for clarification that incumbents will be eligible for reimbursement for multiple units where this is required to maintain the level of service currently provided).

²¹ In some cases, registrants have registered multiple sites under a single earth station registration. Further, in a limited number of cases in which a single applicant sought to register a large number of sites, registration applications were permitted to be filed on a “batch” basis, including up to 50 sites (typically with one antenna per site) on a single application. If more than one site is included on a registration, base lump sum payments will apply to the number of antennas at each site within that registration. As we explain in more detail below, multichannel video programming distributor (MVPD) earth station operators will receive installation costs for technology upgrades on a per-site basis for MVPD incumbent earth stations. If more than one site is included in a registration, the MVPD technology upgrade installation cost will apply to the number of sites within that registration.

²² We explain the lump sum amounts available per incumbent earth station in greater detail in section II below. In short, this approach allows us to develop lump sum amounts per incumbent earth station that best reflect the average, estimated costs of transition.

²³ See National Association of Broadcasters (NAB) May 14, 2020 Comments at 7 (asking the Bureau to “make plain that parties may rely on line items included elsewhere in the Catalog if necessary and appropriate for the transition – that is, an earth station should be able to include a line item set forth in another category of expenses if that line item is appropriate and reasonably necessary for the earth station to migrate”).

²⁴ *3.7 GHz Report and Order*, 35 FCC Rcd at 2422, para. 194.

²⁵ *Id.* at 2422-23, paras. 194-95; see also Eutelsat S.A. (Eutelsat) May 14, 2020 Comments at 8 (arguing that cost catalog should clarify the basis for potential cost allocations to ensure that only costs that are necessary to the relocation process are reimbursable and to minimize gold-plating).

²⁶ *3.7 GHz Report and Order*, 35 FCC Rcd at 2422-23, paras. 194-95.

to receive reimbursement for those recurring expenses for a period sufficient to achieve the transition.²⁷

B. Changes to Cost Catalog Cost Items and Tables

9. In response to commenters' requests and input, the Cost Catalog contains updated cost items and tables that the Bureau, with assistance from RKF, determines to be expenses that incumbents are likely to incur in a typical transition. For example, in response to information from commenters such as the Church of Jesus Christ of Latter-Day Saints (JCLDS), Cox Communications, Inc. (Cox), and NCTA, we clarify or add daily or monthly rental expenses for various items that we expect would be incurred in a typical transition.²⁸ Several commenters provide additional information regarding dual illumination costs or potential clarifications to those cost items, so we add the potential expense of paying for additional satellite capacity to allow for dual illumination during the transition and make clarifications to the dual illumination cost items.²⁹ In addition, based on information from commenters such as Trinity Broadcasting Network (Trinity), JCLDS, SES, Telesat Canada (Telesat), and NCTA, we insert options for various travel expenses,³⁰ interconnection options (cabling, fiber connections),³¹ landscaping, tree removal, fencing,³² and other expenses that may not appear to be part of an earth station, but may nevertheless be necessary expenses for the transition.

10. We also include additional technical equipment components that were not originally included in the tables, but that parties persuasively argue are likely to be necessary to complete the transition.³³ We add numerous cost items associated with the relocation or construction of new earth stations (i.e., antennas), mounting platforms, and supporting facilities, in response to information from ACA and NAB that we determine to be reasonable expenses.³⁴ Based on the comments, we also include additional cost items for moving to higher order modulation (Section V Technology Upgrades), like the inclusion of additional equipment components, shipping costs, and project management costs.³⁵ Finally, we note that Table III-B-2 contains new cost items for 6.5-, 7.2-, and 13.5-meter receive-only antennas

²⁷ Accordingly, we decline to adopt SES's proposal to establish a requirement that earth station operators' increased operating costs and service agreements for new equipment are covered for a period of five years, as such a requirement was not set forth in the *3.7 GHz Report and Order*. SES May 14, 2020 Comments at 5-7.

²⁸ See, e.g., JCLDS Comments at May 14, 2020 at 6 (asking Bureau to include costs of acquiring a ladder or bucket truck); Cox May 14, 2020 Comments at 12-13 (asking Bureau to include costs of acquiring a ladder or bucket truck and to increase cost of rental antennas); NCTA May 14, 2020 Comments at 18 (asking Bureau to include daily cost of mobile truck rental).

²⁹ See, e.g., SES May 14, 2020 Comments at 3-4 (asking Bureau to include various dual illumination costs); NAB May 14, 2020 Comments at 5-6 (asking Bureau to establish weekly or monthly dual illumination expenses).

³⁰ See, e.g., Trinity May 14, 2020 Comments at 2 (asking Bureau to clarify travel costs); JCLDS May 14, 2020 Comments at 3, 8 (outlining various travel costs).

³¹ See, e.g., SES May 14, 2020 Comments at 3 (seeking inclusion of fiber costs); Telesat May 14, 2020 Comments at 3 and Attach. at 7 (proposing costs for trenching and cabling).

³² See, e.g., NCTA May 14, 2020 Comments at 19 (seeking inclusion of landscaping costs); Telesat May 14, 2020 Comments at 3 and Attach. at 7 (proposing cost estimates for fencing, tree removal).

³³ See, e.g., ACA May 14, 2020 Comments, Attach. at 9, 10, 14, 18 (outlining various items like core network components, chassis, power splitters, and other items); NCTA May 14, 2020 Comments at 18-21 (outlining various items like switches, power meters, dehydrators, RF loads, and other components).

³⁴ See, e.g., ACA May 14, 2020 Comments at 11, Attach. at 11-17 (outlining multiple items including surveying costs, permitting, coordination, HVAC installation, and other expenses associated with new construction); NAB May 14, 2020 Comments at 5 (proposing foundation costs).

³⁵ See, e.g., NCTA May 14, 2020 Comments at 20-23 (outlining costs for project management, shipping, and various equipment components).

based on information from commenters.³⁶

11. We reject certain requests for changes to the cost items or tables. For instance, we reject arguments that certain cost items should be moved to different tables or duplicated in various tables;³⁷ instead, we clarify that parties are not limited to cost items within any one table if their transition requires items from other tables (*e.g.*, a party using Table III-B-2 to install a new antenna may need to trim a tree to view the satellite, which is a cost item in Table III-B-1). Because there are a wide range of components in the various tables that parties can choose from, we attempted to minimize repetition where possible. Some commenters also ask us to include more granular detail about potential soft costs that may be incurred in a particular type of transition.³⁸ Many of these costs are already addressed in other tables in the Cost Catalog. Given that parties may claim reimbursement for costs in any table in the Cost Catalog—some of which break out potential soft costs in greater detail—we find it unnecessary to add redundant soft costs in other tables. We remind parties, however, that the *3.7 GHz Report and Order* established that soft costs are subject to a rebuttable presumption of 2% of hard costs and we make clear that soft costs are subject to that limitation regardless of the amounts listed in the Cost Catalog.³⁹ Finally, we note that the Clearinghouse has the ability to reimburse an eligible entity for any unique expense not specified in the Cost Catalog on a case-by-case basis so long as that expense is reasonably necessary to a timely transition. Accordingly, we do not include certain cost items that we determine are not likely to be incurred in a typical transition or are not presumptively reasonable.⁴⁰ Likewise, we do not expand or explicitly break out additional costs for certain categories, such as those associated with “occasional use” or “temporary fixed” operators as requested by some commenters.⁴¹

³⁶ See AT&T May 14, 2020 Comments at 7; NAB May 14, 2020 Comments at 4 (asking Bureau to include estimates for 5.6- and 7.3-meter antennas or larger). Because parties did not provide specific cost information for the larger antenna sizes we included, the Bureau, in consultation with RKF, determined the presumptively reasonable costs for those items based on information from vendors regarding commercial offerings.

³⁷ See, *e.g.*, Intelsat May 14, 2020 Comments at 6, 7 (urging the relocation of tables III-A-3 and III-A-4 to another table and that certain costs be added to table III-B-5); SES May 14, 2020 Comments at 3-4, 12-13 (suggesting various items be added or moved to different tables); ACA May 14, 2020 Comments at 12 and Attach. at 7-9 (arguing that some of the cost elements associated with bi-directional earth stations or Fixed Services are also applicable to receive-only earth station migration).

³⁸ See, *e.g.*, AT&T May 14, 2020 Comments at 3-4 (asking to separate out soft costs specific to technology upgrades); Altice USA, Inc. Comments at 3-4 (noting that the Cost Catalog should include additional soft cost expenses that earth station operators will face as they transition).

³⁹ *3.7 GHz Report and Order*, 35 FCC Rcd at 2424-25, para. 198.

⁴⁰ See, *e.g.*, SES May 14, 2020 Comments at 2-3 (seeking addition of certain gateway relocation costs such as those required to acquire a new facility); Intelsat May 14, 2020 Comments at 4-5 (seeking addition of itemized program management costs); A&E Television Networks, LLC, Discovery, Inc., FOX Corporation, The Walt Disney Company, Univision Communications, Inc., and ViacomCBS Inc. (Content Companies) May 14, 2020 Comments at 5 (seeking inclusion of additional transition costs such as programmer affiliate coordination, integration, testing, and training costs). We have also removed the cost item for Tribal fees previously included in Table IV-D-4 given the Commission’s clarification in 2018 that, consistent with the Advisory Council on Historic Preservation’s 2001 Fee Guidance, applicants are not required to pay a tribe for providing its views in the Section 106 process. See *Accelerating Wireless Broadband Deployment by Removing Barriers to Infrastructure Investment*, WT Docket No. 17-79, Second Report and Order, 33 FCC Rcd 3102, 3152, para. 114 (2018). The Commission clarified “the circumstances under which an applicant may be required to retain an appropriately qualified expert, who may be a representative of a Tribal Nation or [Native Hawaiian Organization], to perform consultant services for which that expert may reasonably expect to be compensated.” *Id.* In light of this clarification, we determine that Tribal fees *per se* would not be assumed in a typical transition for Fixed Service licensees.

⁴¹ AT&T May 14, 2020 Comments at 4-5 (requesting cost break-outs for occasional use to address different sized antennas and different filtering).

C. Updated Costs

12. The final Cost Catalog also updates the cost estimates previously included in the preliminary cost catalog to account for reasonable changes proposed by commenters.⁴² For example, we expand the cost range for a single launch in response to information that SpaceX and Intelsat submitted.⁴³ We increase the upper end of the range for several cost categories within the earth station filtering, retuning, and repointing tables to reflect information provided by NAB, NCTA, Cox, and Telesat.⁴⁴ We also increase the upper range of costs for certain categories within the earth station equipment cost tables, to reflect information provided by SES, Telesat, Cox, NCTA, and AT&T,⁴⁵ and we clarify what is included within some of those categories.⁴⁶ We also update the cost estimates for 13-meter limited motion antennas⁴⁷ and 13-meter full performance antennas⁴⁸ in response to information provided by Intelsat and SES. We increase the site infrastructure buildout costs for Telemetry, Tracking, and Command site consolidation and clarify that those costs include civil works.⁴⁹ In addition, we increase the cost estimate for certain site and project costs for fixed services, including power and telco utility coordination, environmental site visits, and soil boring and reports.⁵⁰ Finally, we increase the encoding/statmux equipment costs for uplink technology upgrades and clarify what may be included in those costs.⁵¹

13. While the Cost Catalog reflects most of the commenters' suggested changes to cost estimates, not all of the commenters' requested changes are appropriate for inclusion in the final Cost Catalog. In particular, costs that cannot be properly ascertained and validated are not included in the Cost Catalog; these costs would nonetheless be reimbursable on a case-by-case basis if the requesting party

⁴² Because the *3.7 GHz Report and Order* provides that “[r]eimbursement submissions that fall within the estimated range of costs in the cost category schedule . . . shall be presumed reasonable,” the Bureau has only updated the cost estimates where it determines them to be reasonable. *3.7 GHz Report and Order*, 35 FCC Rcd at 2448, para. 262; *see also* 47 CFR § 27.1416(a).

⁴³ *See* Intelsat May 14, 2020 Comments at 3-4 (noting potential higher cost if satellite operators must use a higher cost launch provider); Letter from David Goldman, Director of Satellite Policy, Space Exploration Technologies Corp., to Marlene H. Dortch, Secretary, FCC, at 1 (filed May 13, 2020) (noting lower cost for single launch).

⁴⁴ *See* NAB May 14, 2020 Comments at 4 (proposing increased cost for passband filter installation); NCTA May 14, 2020 Comments at 23 (proposing increased costs for fiber transmitters and receivers); Cox May 14, 2020 Comments at 13 (proposing increased costs for replacing cabling from antenna to headend); Telesat May 14, 2020 Comments, Attach. at 4 (proposing increased costs for repointing antennas).

⁴⁵ SES May 14, 2020 Comments at 8 (proposing increased cost for a 3.7-meter antenna with single-feed system); Telesat May 14, 2020 Comments, Attach. at 6-7 (proposing increased cost for antenna installation or move with foundation, trenching for cables, and mount upgrade options and clarification of what is included within those categories); Cox May 14, 2020 Comments at 12 (proposing increased cost for de-icing systems); NCTA May 14, 2020 Comments at 23 (proposing increased costs for foundation kits for small near full-arc multibeam antennas and for C-band dual polarity feed assembly full system installation for large near full-arc multibeam antenna); AT&T May 14, 2020 Comments at 7 (proposing increased cost for C-band dual polarity feed assembly for large near full-arc multibeam antenna).

⁴⁶ Telesat May 14, 2020 Comments at 3 and Attach. at 7 (proposing clarification of what is included within categories of antenna installation or move, trenching, and mount upgrade options).

⁴⁷ SES May 14, 2020 Comments at 2.

⁴⁸ Intelsat May 14, 2020 Comments at 7.

⁴⁹ *Id.* at 8.

⁵⁰ Telesat May 14, 2020 Comments, Attach. at 16.

⁵¹ NAB May 14, 2020 Comments at 3-4 (proposing increased cost of encoding and statmux equipment); NCTA May 14, 2020 Comments at 21-22 (proposing clarification of what encoding/statmux equipment category includes).

demonstrates that the costs are reasonable and necessary for a specific transition. For instance, some proposed cost estimates could not be validated to the degree necessary to deem them presumptively reasonable for a typical transition but could be reimbursed if the Clearinghouse finds they satisfy the standard adopted by the Commission for a specific transition.⁵² We also reject suggestions that the costs included in the Cost Catalog should account for potential price increases resulting from increased demand for items, the challenges of COVID-19, and other requests to anticipate future price increases in the catalog⁵³ because we cannot accurately predict, much less validate, future price increases in the catalog. Nevertheless, the Clearinghouse has the ability to reimburse costs that may exceed the values in the Cost Catalog should it find them reasonable and necessary to the transition and should the incumbent seeking reimbursement demonstrate that the values in the Cost Catalog were not sufficient for a particular expense.⁵⁴

D. Additional Issues Raised by Commenters

14. Commenters also seek clarification on a number of issues that are beyond the scope of the Cost Catalog. As we have previously explained, the purpose of the Cost Catalog is to identify potential expenses that incumbents are likely to incur and to provide a range of reasonable costs for those expenses.⁵⁵ It is not intended to be an exhaustive list of the only categories eligible for reimbursement.⁵⁶ Accordingly, we decline to adopt commenters' requests to the extent they ask the Bureau to go beyond the requirements adopted in the *3.7 GHz Report and Order*.⁵⁷

15. Several parties seek clarification on whether and how certain stakeholders in the chain will be eligible to seek reimbursement for expenses and how earth station operators and other parties in the chain may participate in decisions for technology upgrades.⁵⁸ SES also asks the Bureau to clarify the

⁵² See, e.g., Intelsat May 18, 2020 Comments at 4-5 (proposing program management, staffing, and support expenses); NAB May 14, 2020 Comments at 4 (outlining costs for 5.6- and 7.3-meter antennas); NCTA May 14, 2020 Comments at 23 (proposing costs for uplink filter, foundation kit, and feed assembly).

⁵³ See, e.g., NAB May 14, 2020 Comments at 6; NCTA May 14, 2020 Comments at 9.

⁵⁴ See *3.7 GHz Report and Order*, 35 FCC Rcd at 2447-48, paras. 261-62 (“All incumbents seeking reimbursement for their actual costs shall provide justification for those costs.”); 47 CFR § 27.2427(a).

⁵⁵ *Cost Catalog Comment Public Notice*, 35 FCC Rcd at 4441.

⁵⁶ See, e.g., *id.*, Attach. at 4445 (“While we believe the Catalog is relatively comprehensive, it does not cover every expense, for every situation, nor is it an exhaustive list of all expenses that may potentially qualify for reimbursement.”).

⁵⁷ For instance, we decline to adopt Eutelsat's proposal that we establish in the Cost Catalog that reimbursements are limited to C-band only satellites, and accordingly, “hybrid satellites” (i.e., satellites that include non-C-band transponders) should not be permitted as part of the transition. Eutelsat May 14, 2020 Comments at 2-6. To the extent satellite operators' Transition Plans include satellites with non-C-band transponders, we would expect that such satellite operators would “reasonably allocate the incremental costs of” any functionalities “that are not needed to facilitate the swift transition of the band” to themselves and “only seek reimbursement for the costs reasonably allocated to the needed relocation.” *3.7 GHz Report and Order*, 35 FCC Rcd at 2423, para. 194; see also Letter from Laura H. Phillips, Counsel to Intelsat, to Marlene H. Dortch, Secretary, FCC, at 2 (filed May 26, 2020) (Intelsat May 26, 2020 *Ex Parte*) (“[T]o the extent that any satellites necessary to achieve acceleration were to have additional frequencies beyond C-band, Intelsat would only seek reimbursement for the C-band payload costs.”).

⁵⁸ See, e.g., NCTA May 14, 2020 Comments at 8 (asking for clarification that “MVPDs and content companies have the right to participate in the decision-making process regarding what equipment is necessary and appropriate to ensure a successful transition for them”); National Public Radio, Inc. (NPR) May 14, 2020 Comments at 5 (asking for clarification that network operators “may have flexibility to obtain reimbursement directly from the Clearinghouse for network technology upgrades and costs”); AT&T May 14, 2020 Comments at 2-3 (asking for clarification that C-band customers and end users should have a role in decisions about technology upgrades and how these technology upgrades are implemented).

satellite operators' responsibility for certain aspects of the transition.⁵⁹ With the exception of the clarifications we make to technology upgrades for the lump sum process below, we make no determination in this Public Notice on the role stakeholders have in the transition process and instead refer parties to the *3.7 GHz Report and Order*, which establishes the process for transition and for reimbursement.⁶⁰

III. LUMP SUM PAYMENTS

16. The Cost Catalog sets forth the amounts that will be available to incumbent earth station operators electing to receive a lump sum payment in place of their actual reasonable relocation costs.⁶¹ Consistent with the *3.7 GHz Report and Order*, the lump sum payment amounts are based on the average, estimated costs of transitioning incumbent earth stations to the upper 200 megahertz of the C-band. Consistent with our proposed approach in the *Lump Sum Comment Public Notice*, we continue to use a variation of an expected value approach to calculate both the base lump sum payments as well as the technology upgrade installation costs for MVPD incumbent earth stations, which we describe in greater detail below.⁶² Specifically, for both the base lump sum payments (for all antenna types) and for the per-site MVPD technology upgrade installation payment, where we determine that a cost would be part of a typical transition for a particular antenna type or class of earth station and not an outlier (in other words, where it meets a minimum threshold of likelihood that it would be incurred in a typical transition), we multiply the average estimated cost (calculated as the average of the range of costs included in the Cost Catalog) for that particular cost item by the probability that the particular antenna type or class of earth station is likely to incur it.⁶³ While the methodology for calculating lump sums generally remains the same as described in the *Lump Sum Comment Public Notice*, such methodology accounts for the updates to the lump sum categories and amounts made in response to comments on the *Lump Sum Comment Public Notice*.⁶⁴ Below, we describe those updates and establish the process for incumbent earth station

⁵⁹ SES May 14, 2020 Comments at 11 (arguing that Commission should clarify that, where an earth station downlinks from multiple satellite operators, the space station operators may identify their own antennas and filter them, while the remaining untended antennas on a site are the responsibility of the site operator); *id.* at 11-12 (arguing that Commission should clarify satellite operators' responsibility in tracking down inaccurate information in IBFS).

⁶⁰ *See, e.g., 3.7 GHz Report and Order*, 35 FCC Rcd at 2422, 2427, 2447-48, 2454-55, paras. 193, 202, 260-61, 287, 292-93.

⁶¹ *Id.* at 2427-28, paras. 202-203. The *3.7 GHz Report and Order* established that incumbent earth station operators may accept either: (1) reimbursement for their actual reasonable relocation costs to maintain satellite reception; or (2) a lump sum reimbursement "based on the average, estimated costs of relocating all of their incumbent earth stations" to the upper 200 megahertz of the C-band. *Id.* at 2427, para. 202. *But see id.* at 2428, para. 204, n.550 (noting that "incumbent earth stations owners may not elect a lump sum payment for earth stations outside of the contiguous United States"). The *3.7 GHz Report and Order* directed the Bureau to announce the lump sum payment that will be available per incumbent earth station. *Id.* at 2428, para. 203.

⁶² *See Lump Sum Comment Public Notice* at 4.

⁶³ For example, for purposes of the base lump sum calculations, we estimate that 95% of antennas would have filters installed, but that 5% of antennas would need a new low-noise block downconverter installed that would already include the filter. Accordingly, we multiply the average filter cost by 0.95 and we multiply the average cost of low-noise block downconverter by 0.05; both costs are then added to the base lump sum amounts. Where a cost is likely to be incurred only in outlier transitions for a particular antenna type or earth station class, we do not include the probability of incurring such a cost in the lump sum amount.

⁶⁴ Some commenters ask the Bureau to disclose additional detail on the methodology and assumptions for calculating the lump sum. *See, e.g.,* NCTA June 15, 2020 Comments at 4; JCLDS June 15, 2020 Comments at 3 & n.5; Letter from Danielle Piñeres, Vice President and Associate General Counsel, NCTA, to Marlene H. Dortch, Secretary, FCC, at 2-3 (filed July 9, 2020); *see also* ACA June 15, 2020 Comments at 7-8 (raising issue with amount of information disclosed in the *Lump Sum Comment Public Notice*). Commenters previously requested release of

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operators to make their lump sum elections.⁶⁵

A. The Cost of Integrated Receivers/Decoders and Transcoders for MVPD Technology Upgrades Are Separate from the Lump Sum Process

17. The lump sum amounts for all MVPD incumbent earth stations include the average, estimated costs associated with installing any necessary compression-related technology upgrades at an MVPD earth station site, but they do not include the cost to purchase the integrated receivers/decoders or transcoders for those technology upgrades.⁶⁶ After review of the record, we believe that the selection and purchase of compression equipment for these technology upgrades—such as integrated receivers/decoders and transcoders—are an integral part of the satellite operators’ nationwide transition process and, as such, they should be considered as part of the cost associated with the transition of satellite transponders.⁶⁷ Thus, satellite operators, in cooperation with programmers, will be responsible for selecting, purchasing, and delivering the necessary compression equipment to respective earth stations. In contrast, the costs associated with physically installing the compression equipment at the earth station site are more appropriately assigned to the earth station operator (and are thus included in the MVPD lump sum amount), given that a satellite operator will not usually have direct access to an earth station site, and the earth station owner will be the one exercising direct control over that process.⁶⁸ Accordingly, all MVPD

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 additional information and we have rejected those requests. *See Expanding Flexible Use of the 3.7 to 4.2 GHz Band*, GN Docket No 18-122, Order, DA 20-622, at 3, para. 7 (WTB June 12, 2020).

⁶⁵ Several commenters raise again the argument that we should wait to finalize the lump sum amounts until after satellite operators file their Transition Plans so that parties can provide additional comment on the lump sum amounts after they review those Transition Plans. *See* ACA June 15, 2020 Comments at 22-23; NCTA June 15, 2020 Comments at 2-3. Satellite operators filed their initial Transition Plans in the Electronic Comment Filing System on June 19, 2020; those plans have been made available for public comment. *See* GN Docket No. 20-173. Satellite operators will file their final Transition Plans prior to the deadline for lump sum elections, allowing earth station operators to consider the Transition Plans in making their lump sum elections should they choose to do so.

⁶⁶ This reflects a change from the approach to technology upgrades for which we sought comment in the *Lump Sum Comment Public Notice*, which would have included the cost and installation of technology upgrades (i.e., MVPD Downlink Technology Upgrades and Program Source Uplink Technology Upgrades) only for those MVPD incumbent earth stations that verified the need for such upgrades. *See Lump Sum Comment Public Notice* at 3, 5.

⁶⁷ *See, e.g.*, Letter from Laura H. Phillips, Counsel to Intelsat, to Marlene H. Dortch, Secretary, FCC, at 2 (filed June 24, 2020) (Intelsat June 24, 2020 *Ex Parte*) (“[T]he decision to compress is made at the transponder level in concert with the programmers for whom compression is applicable, and . . . the technology choice must as a practical matter be made by the programmer because the same technology necessarily must be implemented throughout the programmer’s distribution system to ensure continued reception of the programming.”); Letter from Michael P. Goggin, Assistant Vice President – Senior Legal Counsel, AT&T, to Marlene H. Dortch, Secretary, FCC, at 2-3 (filed July 7, 2020) (AT&T July 7, 2020 *Ex Parte*) (arguing that integrated receiver/decoder costs should be allocated as satellite expenses and explaining that “the acquisition of compatible IRDs” must be left in satellite companies’ hands because they will determine—with programmers—“which streams are compressed and how they are compressed”); Letter from Laura H. Phillips, Counsel to Intelsat, to Marlene H. Dortch, Secretary, FCC, at 1 (filed July 27, 2020) (Intelsat July 27, 2020 *Ex Parte*).

⁶⁸ *See 3.7 GHz Report and Order*, 35 FCC Rcd at 2426, para. 201 (indicating that earth station migration may “require the *installation* of new equipment or software” at earth station locations “for customers identified for technology upgrades necessary to facilitate the repack, such as compression technology or modulation”) (emphasis added); *see also* Intelsat June 24, 2020 *Ex Parte* at 3 (“[T]he lump sum amount to be specified for the various types of earth stations should be sufficient to cover the MVPD’s labor costs associated with installing the IRDs and related equipment provided by either satellite operators or by programmers. This demarcation would assign compression-related costs to the appropriate entities.”); Letter from Matthew S. DelNero, Counsel to Content Companies, to Marlene H. Dortch, Secretary, FCC at 2, 4 (filed July 6, 2020) (Content Companies and NAB July 6, 2020 *Ex Parte*) (proposing approach that allocates installation costs for integrated receivers/decoders to MVPD lump sum, and noting that traditionally “MVPDs are indeed responsible for installing decoding equipment”); Letter from Laura H. Phillips, Counsel to Intelsat, to Marlene H. Dortch, Secretary, FCC, at 1-2, n. 2 (filed July 7, 2020) (Intelsat July 7,

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earth station operators that elect the lump sum will receive the relevant lump sum base amounts, including the estimated costs to install integrated receivers/decoders and transcoders (including labor, cabling, and any necessary equipment for such installation, as described in more detail below). The installation costs for technology upgrades will be available to all MVPD earth station operators that elect the lump sum.

18. As noted, the lump sum amount for MVPD incumbent earth stations excludes the cost of compression equipment (i.e., integrated receivers/decoders and transcoders) for technology upgrades. We agree with commenters who argue that satellite operators, together with programmers, must be able to select and purchase compression equipment uniformly and on a nationwide basis—and to coordinate the technology upgrade process—to accomplish a successful transition.⁶⁹ To ensure that satellite operators are able to meet the accelerated transition deadlines and to avoid inconsistent or untimely deployment of technology upgrade equipment which could disrupt content delivery, we make clear that satellite operators, in cooperation with programmers, bear responsibility for selecting and purchasing compression

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2020 *Ex Parte*) (“Technology upgrades such as compression are an ongoing part of normal business operations and the lump sum option should not upend these processes. Upgrades are initiated at the discretion of the content provider because the content provider is the beneficiary of improved technology and reduced bandwidth consumption. As such, in the vast majority of upgrades all equipment required at the headend is provided by the content provider and installed by the headend operator. Bifurcating the equipment and the labor is the most natural and efficient outcome to speed the transition.”); Letter from Jennifer L. Oberhausen, Director, Regulatory Affairs, CTIA, to Marlene H. Dortch, Secretary, FCC, at 2 (filed July 9, 2020) (CTIA July 9, 2020 *Ex Parte*) (noting that allocating costs of “designing and procuring technology upgrades” to satellite operators (for Clearinghouse reimbursement), while treating “the labor costs associated with installing the upgrades at each earth station” as earth station relocation costs will “promote a centralized technology upgrade process that, in turn, will best achieve rapid and coordinated C-band clearing”).

⁶⁹ See, e.g., Intelsat May 26, 2020 *Ex Parte* at 2-3 (“[C]ompression equipment – such as integrated receivers/decoders (‘IRDs’) – should be tied to the satellite transponder because only the earth stations associated with the compressed transponder would need to install these IRDs (or similar compression equipment). Moreover, all affiliates of the programmer being compressed must install the same equipment as the programmer; the affiliates cannot each select their own technology or the programmer will not have an acceptable compression solution and the acceleration timetable likely will not be met.”); Content Companies June 15, 2020 Comments at 2-4 (arguing that the integrated receiver/decoder upgrade process “requires careful management and coordination by programmers and their satellite operator vendors” and that in many cases, programmers bear the costs of compression upgrades); NCTA June 15, 2020 Comments at 12 (explaining that “choices about” deployment of technology upgrade equipment “must be made at the national level and adopted across a programmer’s distribution chain to ensure that consumers receive high quality service”); AT&T May 14, 2020 Comments at 2-3 (noting that “satellite operators are best positioned to determine, on a customer-by-customer basis, where technology upgrades are necessary to ensure that capacity needs are met post-migration”); Letter from Matthew S. DelNero, Counsel to Content Companies, to Marlene H. Dortch, Secretary, FCC, at 2 (filed June 30, 2020) (Content Companies and NAB June 30, 2020 *Ex Parte*) (“Allocating IRD costs to programmers and satellite operators would serve the transition by centralizing the compression upgrade process and enabling the coordinated installation of the correct IRDs across distribution networks consisting of thousands of earth stations. Centralizing the upgrade process is critical because, prior to delivery, IRDs will need to be configured with the operating parameters of the networks whose signals they will decode. Accordingly, any decentralized approach poses a risk of significant delay for an already accelerated transition timeline.”); Content Companies and NAB July 6, 2020 *Ex Parte* at 3-4 (“Compression technology will not function properly unless it is uniform across a programmer’s network, and ensuring the timely installation of the necessary equipment at every connected earth station requires careful planning and coordination in the procurement, configuration, and distribution of this equipment. . . . [I]t is imperative that programmers play the central role in coordinating the various segments of the upgrade process.”); AT&T July 7, 2020 *Ex Parte* at 2 (arguing that the process for implementing integrated receivers/decoders “cannot be decentralized” and explaining that “different programmers will make different decisions” about compression that “have to be made at the source, as the programmer uplinks a stream that must be decoded and decompressed by thousands of MVPDs”); CTIA July 9, 2020 *Ex Parte* at 2 (“To best ensure a successful transition, the prudent course would be for the Commission to determine that designing and procuring technology upgrades is primarily the obligation of the C-band satellite operators working with programmers.”); Intelsat July 27, 2020 *Ex Parte* at 1-2.

equipment for any necessary technology upgrades.⁷⁰

19. To the extent that compression technology equipment is reasonably necessary to complete the transition, consistent with the standards set forth in the *3.7 GHz Report and Order*, the satellite operator may agree to shift costs to purchase that equipment to a third party (other than the lump-sum-electing earth station), and that third party may recover such costs through the Clearinghouse.⁷¹ Under these circumstances, the party that purchases the equipment for such a technology upgrade—either the incumbent satellite operator or a programmer designated by the satellite operator to purchase the equipment (as provided for in the *3.7 GHz Report and Order*)⁷²—may seek reimbursement from the Clearinghouse for its actual costs; the fact that the incumbent earth station operator receiving the equipment has chosen to accept a lump sum payment is irrelevant, as the lump sum payment does not include the costs of purchasing such equipment.⁷³

⁷⁰ See Letter from Matthew S. DelNero, Counsel to Content Companies, to Marlene H. Dortch, Secretary, FCC, at 4-5 (filed July 24, 2020) (Content Companies July 24, 2020 *Ex Parte*); Intelsat June 24, 2020 *Ex Parte* at 2-3 (explaining that “Intelsat envisions that the necessary IRDs and related equipment would be procured centrally” rather than by individual MVPDs and that “there is no reason to include IRD costs in any lump sum amount”); Intelsat May 26, 2020 *Ex Parte* at 3 (“[I]f a programmer were to decide to employ compression technology today, that programmer would select its compression equipment and deliver that equipment to its affiliates, who would be obligated to install it pursuant to their affiliate agreements with the programmer. There is no reason for the FCC to alter this long-standing process.”); Content Companies and NAB July 6, 2020 *Ex Parte* at 4 (“In prior transitions, programmers have coordinated bulk purchases of IRDs . . . to not only secure a lower per-unit price, but also to ensure that these sellers have sufficient notice to provide the large number of IRDs needed. Equipment manufacturers and vendors likely will not, without adequate notice, have on hand the number of IRDs necessary to meet the aggregate demand of thousands of independent earth station purchase orders. The failure of a decentralized upgrade process to account for this supply-side reality illustrates the potential for such decentralization to delay and disrupt the C-band transition.”); Content Companies June 15, 2020 Comments at 2-4 (explaining that the “preliminary Cost Catalog appropriately described the purchase and distribution of IRDs as a satellite and programmer expense” because the “IRD upgrade process . . . requires careful management and coordination by programmers and their satellite operator vendors,” which could be undermined if the Bureau includes integrated receiver/decoder costs in the lump sum payment); AT&T July 7, 2020 *Ex Parte* at 2-3 (“Recognizing that the satellite companies will determine, in conjunction with the programmers, which streams are compressed and how they are compressed, the acquisition of compatible IRDs must be left in their hands, regardless of how responsibility for installing the upgrades is ultimately apportioned.”).

⁷¹ The *3.7 GHz Report and Order* precludes earth stations electing the lump sum from submitting additional costs to the Clearinghouse for reimbursement. *3.7 GHz Report and Order*, 35 FCC Rcd at 2427, para. 202 (“Incumbent earth station owners that elect the lump sum payment will not be eligible to submit estimated or actual reasonable relocation costs to the Clearinghouse.”); see also 47 CFR § 27.1412(e).

⁷² *3.7 GHz Report and Order*, 35 FCC Rcd at 2447, para. 260 (establishing when a programmer may seek reimbursement for costs from the Clearinghouse).

⁷³ Accordingly, we decline commenters’ requests to delete the following language from section V of the preliminary Cost Catalog: “[R]eimbursement for and distribution of [upgrade] equipment is anticipated to flow through the satellite operators and is not part of earth station costs (except for labor for installing said equipment). In this way, the satellite operators are both responsible and accountable for the successful repacking of their operations into the upper 200 megahertz.” *Cost Catalog Comment Public Notice*, Attach., 35 FCC Rcd at 4464; see also NCTA May 14, 2020 Comments at 6 (asking to delete language from section V of the Cost Catalog); NAB May 14, 2020 Comments at 9 (asking to ensure the language regarding satellite operators’ responsibility for the transition at section V of the catalog does not cause confusion); AT&T May 14, 2020 Comments at 3 (arguing that the language at section V of the catalog seeks to limit the role of C-band customers and end users). We believe this language, with some revisions to reflect the approach discussed in this section with respect to technology upgrade installation costs, addresses the role stakeholders will play in the technology upgrade process. We also make clear that while the satellite operator will be in charge of directing the transition and choosing the compression technology equipment in the first instance, it is permissible—in cases where an earth station operator opts to recover costs under the line-item approach—for the satellite operator and the earth station operator to agree to leave the purchase of such

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20. This determination is based, in part, on the comments we received in response to the *Lump Sum Comment Public Notice*. Removing the cost of compression equipment for technology upgrades from an MVPD operator’s lump sum amount—but including the installation costs of such equipment in the lump sum amount for all MVPDs—best addresses the concerns commenters raise in response to our proposed approach in the *Lump Sum Comment Public Notice* in a manner consistent with the *3.7 GHz Report and Order*. Although some commenters argue that MVPD operators, rather than satellite operators or programmers, are responsible for purchasing and installing compression equipment for technology upgrades and thus endorse including compensation for such upgrades as part of the lump sum payment,⁷⁴ these commenters do not appear to dispute the claims that satellite operators and programmers need to decide which equipment is needed for technology upgrades, and that they will need to do so on a nationwide basis.⁷⁵ Although commenters provide conflicting information about which party typically is contractually responsible for purchasing and performing technology upgrades,⁷⁶ we are (Continued from previous page) _____ equipment to the earth station operator, in which case the earth station operator could obtain compensation by submitting its receipts to the Clearinghouse.

⁷⁴ See, e.g., Cox May 14, 2020 Comments at 5 (“In many instances, MVPDs like Cox are contractually required to bear costs for integrated receive decoders . . . and transcoders.”); ACA June 14, 2020 Comments at 9, n.23 (“ACA Connects disagrees with the suggestion that downlink receiver technology upgrades are not MVPD costs. To begin with, ACA Connects notes that MVPDs and programmers have been managing technology changes in the distribution of programming feeds for decades, and the concerns being raised by the programmers seem to significantly overstate potential problems In most cases (at least with respect to ACA Connects members, who alone represent about half of all MVPD earth stations), programmers are under no contractual obligation to provide IRDs to them.”). Some MVPD operators also argue that they want to “maintain . . . control by taking the lump sum” because they do not want satellite operators to “make any technical, financial, or operational decisions with respect to” their earth stations’ transitions. See Letter from Ross Lieberman, Senior Vice President of Government Affairs, ACA, to Marlene H. Dortch, Secretary, FCC, at 2 (filed June 30, 2020) (ACA June 30, 2020 *Ex Parte*); cf. Letter from Brian D. Weimer, Counsel to SES, to Marlene H. Dortch, Secretary, FCC, at 3-5 (filed July 8, 2020) (SES July 8, 2020 *Ex Parte*) (arguing that satellite operators should not be required to purchase and deliver technology upgrades where earth station operators have opted out of a satellite-operator led transition by electing the lump sum).

⁷⁵ See Letter from Barry J. Ohlson, Vice President, Regulatory Affairs, Cox, to Marlene H. Dortch, Secretary, FCC, Attach. at 1 (file June 19, 2020) (Cox June 19, 2020 *Ex Parte*) (“Although programmers will determine the technical standards for the delivery of programming to MVPD headends, MVPDs will in fact bear many of the technology costs necessary to receive such content.”) (emphasis added); ACA June 14, 2020 Comments at 9, n.23 (“ACA Connects does not dispute the programmers’ claim that they have control over what IRD devices MVPDs may utilize, ACA Connects agrees that this decision-making authority, as laid out in existing contracts, should not, and need not, be disturbed.”); SES July 8, 2020 *Ex Parte* at 2 (agreeing that the technology upgrade implementation process “should remain centralized to ensure a smooth-running accelerated transition, even for electing earth station operators that continue C-band service”).

⁷⁶ Compare Content Companies June 15, 2020 Comments at 4 (noting that “in many cases, programmers’ agreements with the MVPD earth stations that receive their signals specify that the programmer, not the MVPD, bears the costs of compression upgrades”); Content Companies and NAB July 6, 2020 *Ex Parte* at 4 (noting that “a few cable operators have suggested that MVPDs, not programmers, bear the responsibility of acquiring compression technology during these transitions, but that approach is simply not reflective of common practice” and explaining that “[i]n reality, programmers direct virtually every stage of the upgrade process, from choosing the compression format and identifying the IRD and equipment needs of affiliate earth stations to ordering the appropriate equipment”); Intelsat May 26, 2020 *Ex Parte* at 3 (explaining that “if a programmer were to decide to employ compression technology today, that programmer would select its compression equipment and deliver that equipment to its affiliates, who would be obligated to install it”); Intelsat June 24, 2020 *Ex Parte* at 2 (“Historically, the programmers have designed, procured and distributed the compression equipment to the headend, enabling them to bulk order IRDs to ensure their timely supply, as well as to orchestrate the coordinated installation of the new program distribution network in thousands of MVPD locations.”); with Cox May 14, 2020 Comments at 5 (“In many instances, MVPDs like Cox are contractually required to bear costs for integrated receive decoders . . . and transcoders.”); Cox June 19, 2020 *Ex Parte*, Attach. at 1 (“Although programmers will determine the technical

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unable to verify such arguments, nor is such verification necessary.⁷⁷ Regardless of the private contractual arrangements of the parties, which the Commission's *3.7 GHz Report and Order* did not intend to change or modify,⁷⁸ the record reflects that the most efficient approach to ensure a smooth transition is to assign satellite operators, in cooperation with programmers, responsibility for selecting and purchasing those upgrades as part of the satellite operators' transition.⁷⁹ Allowing MVPD operators to maintain individual responsibility for installing such equipment strikes an appropriate balance by allowing MVPD operators to maintain control over the portion of their transition specific to their own earth stations.

21. This approach is consistent with the *3.7 GHz Report and Order* and the Commission's direction to the Bureau "to identify lump sum amounts" based on the "average, estimated costs of relocating all of" an electing earth station operator's incumbent earth stations.⁸⁰ Based on review of the

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standards for the delivery of programming to MVPD headends, MVPDs will in fact bear many of the technology costs necessary to receive such content."); ACA June 14, 2020 Comments at 9, n.23 ("In most cases (at least with respect to ACA Connects members, who alone represent about half of all MVPD earth stations), programmers are under no contractual obligation to provide IRDs to them."); ACA June 30, 2020 *Ex Parte* at 3 (noting that in the experience of ACA members, "it is MVPDs that foot the bill" for replacement integrated receivers/decoders).

⁷⁷ Consistent with the *3.7 GHz Report and Order*, our approach has no effect on the contractual responsibilities of the parties. See, e.g., *3.7 GHz Report and Order*, 35 FCC Rcd at 2447, para. 260, n. 654 ("We also clarify that nothing in this *Report and Order* is intended to affect or change the terms of any private contractual arrangement governing responsibility for such work.").

⁷⁸ See *id.* at 2447, para. 260, n. 654.

⁷⁹ Content Companies June 15, 2020 Comments at 1-4 ("[T]he Commission should not overlook the economic inefficiencies of including IRDs in lump sum payments to MVPDs. Unlike individual MVPDs that would purchase a relatively small number of IRDs, satellite operators and/or programmers would be purchasing many thousands of IRDs at bulk rates that would reduce per-unit costs."); Intelsat June 24, 2020 *Ex Parte* at 3 ("[T]he success of compression efforts relies on the IRD and related equipment costs being borne by the satellite operators that will be ordering equipment chosen by their programmer customers."); Intelsat May 26, 2020 *Ex Parte* at 2-3 (arguing that if affiliates of programmers can select their own equipment, transition timelines "likely will not be met"); NCTA June 15, 2020 Comments at 12 (explaining that "choices about" deployment of technology upgrade equipment "must be made at the national level and adopted across a programmer's distribution chain to ensure that consumers receive high quality service"); AT&T May 14, 2020 Comments at 2-3 (noting that "satellite operators are best positioned to determine, on a customer-by-customer basis, where technology upgrades are necessary to ensure that capacity needs are met post-migration"); Content Companies and NAB July 6, 2020 *Ex Parte* at 3 ("[U]nless cost-allocation decisions reflect and support the current industry practice of centralizing the compression upgrade process, there is significant risk of delay in the transition and disruption to the video delivery ecosystem."); AT&T July 7, 2020 *Ex Parte* at 2-3 (explaining that an approach that removes selection and acquisition of integrated receivers/decoders from the satellite companies and programmers "raises the possibility of significant impairments to the content distribution network or, at a minimum, unnecessary delay and expense"); Intelsat July 7, 2020 *Ex Parte* at 1-2 ("[I]t would be preferable to exclude any technology upgrade costs from the lump sum opt-out amount, while allowing for labor costs for equipment installation to be included in the earth station opt-out amount. . . . [T]his remains the best overall option from Intelsat's perspective to achieve the necessary compression within the accelerated timetable while still allowing for an opt-out lump sum payment option for MVPDs.").

⁸⁰ *3.7 GHz Report and Order*, 35 FCC Rcd at 2427-28, paras. 202-203. ACA argues that in excluding the cost of integrated receiver/decoder equipment the Bureau is exceeding that authority delegated to it by the Commission in the *3.7 GHz Report and Order*. See Letter from Ray Hashem, Counsel to ACA, to Marlene H. Dortch, Secretary, FCC, at 6-7 (filed July 17, 2020) (ACA July 17, 2020 *Ex Parte*). We disagree. While, as ACA notes, in the *3.7 GHz Report and Order* the Commission delegates specific authority to the Bureau to "identify lump sum amounts for various classes of earth stations" and to "announce the lump sum that will be available," it also broadly delegates authority to the Bureau "to make further determinations related to reimbursable costs, as necessary, throughout the transition process." *3.7 GHz Report and Order*, 35 FCC Rcd at 2428, 2448, paras. 203, 262; 47 CFR §§ 27.1416(a), 27.1419.

record, the cost of technology upgrade equipment is not part of the “average, estimated costs of relocating” MVPD incumbent earth stations, because those costs are more appropriately tied to the satellite operators’ transition, in coordination with programmers.⁸¹ The *3.7 GHz Report and Order* noted, in its discussion of earth station transitions, that earth station migration may “require the *installation* of new equipment or software” at earth station locations “for customers identified for technology upgrades necessary to facilitate the repack, such as compression technology or modulation.”⁸² In short, while the *3.7 GHz Report and Order* indicates that *installation* of technology upgrades may be an earth station migration cost, it does not mandate that the cost of purchasing the equipment necessary to implement those technology upgrades is an earth station migration cost.⁸³ To the contrary, we here find that allocating such costs to satellite operators is not only consistent with the text of the *3.7 GHz Report and Order*, but also more faithful to its goal of avoiding the disruption of service for FSS operations in the C-band.⁸⁴

22. ACA makes several arguments to support its claim that the *3.7 GHz Report and Order* requires the inclusion of integrated receiver/decoder costs in the lump sum payment.⁸⁵ We find none of these arguments persuasive, because, among other reasons, each seems to beg the question whether integrated receiver/decoder costs are properly allocated to earth station operators or satellite operators. According to ACA, the cost of integrated receiver/decoder equipment should be included in the lump sum because, in establishing the lump sum, the Commission focused on the costs of relocating an earth station, rather than on which entity ultimately would seek reimbursement from the Clearinghouse for any given expense.⁸⁶ But as we have explained above, integrated receiver/decoder equipment costs are more appropriately tied to the transition of satellites than to that of earth stations. Unlike filters, which must be purchased in connection with the transition of an earth station regardless of decisions made at the satellite level, the question of integrated receiver/decoder costs are made on a case-by-case basis pursuant to discussions between the programmer and satellite company.⁸⁷

23. ACA also argues that the lump sum should include any “but for” costs of transitioning earth stations—i.e., “the money that the Clearinghouse would otherwise have paid to relocate earth stations to maintain satellite reception.”⁸⁸ But ACA’s argument proves too much and would mean that the cost of new satellite acquisitions would also have to be included in the lump sum, “on the theory that anticipation of an accelerated transition to fiber . . . impacted the decision of satellite companies around

⁸¹ See, e.g., Content Companies and NAB July 6, 2020 *Ex Parte* at 6; Intelsat June 24, 2020 *Ex Parte* at 2.

⁸² *3.7 GHz Report and Order*, 35 FCC Rcd at 2426, para. 201 (emphasis added).

⁸³ *Id.*

⁸⁴ See, e.g., *3.7 GHz Report and Order*, 35 FCC Rcd at 2410, para. 161 (indicating that it is in the public interest to ensure that FSS operations in the C-band are not disrupted); see also Content Companies July 6, 2020 *Ex Parte* at 6-7 (noting that goal of the C-band proceeding is to ensure that the public interest is served by ensuring that FSS services currently provided in the 3.7-4.2 GHz band are able to continue uninterrupted).

⁸⁵ Letter from Ross Lieberman, Senior Vice President of Government Affairs, ACA, to Marlene H. Dortch, Secretary, FCC, at 5 (filed July 7, 2020) (ACA July 7, 2020 *Ex Parte*) (arguing that “[e]xcluding IRD replacement costs from the lump sum reimbursement . . . would contravene the *3.7 GHz Report and Order*’s dictate for how the lump sum is to be derived”); see also ACA July 17, 2020 *Ex Parte* at 4-5; Letter from Ross Lieberman, Senior Vice President of Government Affairs, ACA, to Marlene H. Dortch, Secretary, FCC, at 2 (filed July 27, 2020) (ACA July 27, 2020 *Ex Parte*).

⁸⁶ ACA July 17, 2020 *Ex Parte* at 5.

⁸⁷ Content Companies July 24, 2020 *Ex Parte* at 1.

⁸⁸ ACA July 17, 2020 *Ex Parte* at 4-5.

satellite launches.”⁸⁹ As the Content Companies note, “the need for IRDs is driven entirely by bilateral decisions and planning between the satellite company and a programmer customer,” meaning that the cost of integrated receiver/decoder equipment “is no more a cost of relocating the MVPD’s earth station than that of the ordering of new satellites.”⁹⁰

24. We also disagree with ACA’s suggestion that the Bureau must maintain integrated receiver/decoder replacement costs within the lump sum reimbursement for MVPDs because “the lump sum is designed to give MVPDs flexibility to either maintain operations in the upper portion of the C-band, or to transition to alternative transport technologies, like fiber, that in some cases would not require the purchase and installation of any integrated receivers/decoders at an earth station site.”⁹¹ ACA argues that not including integrated receiver/decoder costs in the lump sum would “make it significantly more financially difficult for MVPDs to transition to any alternative technologies that are not dependent on the operator having [integrated receivers/decoders] at an earth station site.”⁹² While the *3.7 GHz Report and Order* acknowledges that “providing incumbent earth station operators flexibility may allow them to make efficient decisions that better accommodate their needs,” it also recognizes “that replacing existing C-band operations with fiber or other terrestrial service may be . . . more expensive by an *order of magnitude*.”⁹³ The *3.7 GHz Report and Order* directs the Bureau to establish lump sum amounts based on the “average, estimated costs of relocating” incumbent earth stations, rather than to attempt to approximate the cost of transitioning to alternative transport, and specifically notes that any costs “over and above the lump sum (i.e., additional costs to transition to fiber) would be borne by the electing incumbent earth station operator.”⁹⁴ The Commission signaled in these portions of the *3.7 GHz Report and Order* that the lump sum was never intended to fully fund the cost of converting to fiber,⁹⁵ and we do not believe that excluding integrated receiver/decoder costs from the lump sum will deprive those MVPD earth stations of the flexibility to convert their facilities to fiber.⁹⁶ As we have explained, we have determined that coordination of content delivery and selection of any necessary compression equipment fall within the satellite operators’ transition rather than that of the earth station operators because programmers and satellite companies are best positioned to coordinate efficiently in selecting the

⁸⁹ Content Companies July 24, 2020 *Ex Parte* at 2-3. To extend ACA’s argument to its logical conclusion, if all earth stations elected to take the lump sum and transition to fiber no new satellites would be necessary, and the full \$2.5B estimated cost of replacement satellites should be included in the lump sum.

⁹⁰ Content Companies July 24, 2020 *Ex Parte* at 2.

⁹¹ Letter from Ross Lieberman, Senior Vice President of Government Affairs, ACA, to Marlene H. Dortch, Secretary, FCC, at 3 (filed July 2, 2020) (ACA July 2, 2020 *Ex Parte*); *see also* ACA July 7, 2020 *Ex Parte* at 4-5; Letter from Bill Routt, President and COO, MobiTV, to Marlene H. Dortch, Secretary, FCC at 1-2 (filed July 13, 2020) (suggesting that MVPDs that replace their earth stations with fiber-based video delivery alternatives may not need integrated receivers/decoders at those sites and urging the Commission to “permit MVPDs to use money that would otherwise have been spent on them, including for replacement IRDs, on alternative, forward-looking technologies that do not require individual IRDs at local earth station sites”); Letter from Randy Clarke, Vice President Federal Regulatory Affairs, CenturyLink, to Marlene H. Dortch, Secretary, FCC, at 1-2 (filed July 20, 2020) (indicating that MVPD earth stations that transition to fiber would not always need to install integrated receivers/decoders).

⁹² ACA July 2, 2020 *Ex Parte* at 3; *see also* ACA July 7, 2020 *Ex Parte* at 5.

⁹³ *3.7 GHz Report and Order*, 35 FCC Rcd at 2427, para. 202 (emphasis added).

⁹⁴ *See id.* at 2427-28, paras. 202-203 & n. 547.

⁹⁵ Content Companies July 24, 2020 *Ex Parte* at 3-4.

⁹⁶ *Id.* at 3-4.

appropriate integrated receivers/decoders and transcoder equipment.⁹⁷

25. The lump sum for MVPD earth stations that we identify today, including the installation of technology upgrades, reflects the average, estimated costs of MVPD earth station transitions, as supported by the record. For this reason, we disagree with SES that such an approach conflicts with the “clearing obligations” or “the respective roles and obligations of C-band stakeholders” contemplated in the *3.7 GHz Report and Order*.⁹⁸ The approach adopted here, which clarifies that selection and purchase of compression equipment are not part of an average MVPD transition, does not disrupt the roles of stakeholders or the clearing obligations set forth in the *3.7 GHz Report and Order*.⁹⁹ In fact, as the Content Companies observe, inclusion of integrated receiver/decoder equipment costs in the lump sum could endanger the entire transition, because compression technology “will not function properly unless it is uniform across a programmer’s network.”¹⁰⁰ As explained above, the determination that the purchase of integrated receiver/decoder equipment should be coordinated on a national basis by the satellite operators, while acknowledging the role of earth stations in installing such equipment, reflects exactly those respective roles and obligations that SES highlights.

26. Because nationwide coordination of content delivery, including selection of appropriate compression equipment, is part of a satellite operator’s transition—and not part of an MVPD earth station transition—we also decline to adopt SES’s proposal to make the Relocation Coordinator responsible for purchasing compression equipment where an earth station operator elects the lump sum.¹⁰¹ The *3.7 GHz Report and Order* sets forth the Relocation Coordinator’s responsibilities, which include “establish[ing] a timeline and tak[ing] actions necessary to migrate and filter incumbent earth stations.”¹⁰² While the *3.7 GHz Report and Order* indicates that the Relocation Coordinator may “assist incumbent *earth stations* in transitioning,” it does not contemplate that the Relocation Coordinator would assist satellite operators with transition actions.¹⁰³ Accordingly, the *3.7 GHz Report and Order* does not support SES’s proposed approach to assign the selection and purchase of compression equipment—which are part of the satellite operator’s responsibility—to the Relocation Coordinator. Further, we do not believe that such an approach would meet the needs of satellite operators (in cooperation with their customers, the content providers) to accomplish a timely transition, given that commenters have stated that both must be involved in selecting and overseeing that portion of the transition.¹⁰⁴ Indeed, SES acknowledges the need for centralized selection of compression equipment and the central role that satellite operators, in cooperation with programmers, must play to determine whether such equipment is necessary and then to select the appropriate equipment.¹⁰⁵ SES cannot have it both ways—maintaining centralized selection of

⁹⁷ *3.7 GHz Report and Order*, 35 FCC Rcd at 2427-28, paras. 202-203 & n.547.

⁹⁸ SES July 8, 2020 *Ex Parte* at 4.

⁹⁹ See *3.7 GHz Report and Order*, 35 FCC Rcd at 2455, para. 293.

¹⁰⁰ Content Companies July 24, 2020 *Ex Parte* at 4.

¹⁰¹ See SES July 8, 2020 *Ex Parte* at 2.

¹⁰² *3.7 GHz Report and Order*, 35 FCC Rcd at 2460, para. 313.

¹⁰³ *Id.* (emphasis added).

¹⁰⁴ See, e.g., Intelsat June 24, 2020 *Ex Parte* at 2; Intelsat May 26, 2020 *Ex Parte* at 2-3; AT&T May 14, 2020 Comments at 2-3; Content Companies and NAB July 6, 2020 *Ex Parte* at 3.

¹⁰⁵ See SES July 8, 2020 *Ex Parte* at 3 (“Once the satellite operator has confirmed that a particular programmer should apply compression technology to achieve the optimal number of cleared transponders . . . the type of compression must be chosen by the programmer because the same technology must be implemented throughout the programmer’s distribution system to ensure service continuity. Indeed . . . technology upgrade costs (aside from labor) are not costs that earth station operators should incur.”).

compression equipment without taking responsibility for such equipment.

27. The *3.7 GHz Report and Order* also makes clear that once an earth station operator elects the lump sum, it becomes responsible both “for performing any necessary transition actions . . . consistent with the space station operator’s deadlines . . . for transition”¹⁰⁶ and “for coordinating with the relevant space station operator as necessary and performing all relocation actions on its own.”¹⁰⁷ The Commission mandated that the lump sum election is irrevocable, and earth station operators that elect the lump sum will be responsible for covering any additional unexpected expenses in the event that the costs of the transition may exceed the lump sum amount.¹⁰⁸ Accordingly, as with any other operator that accepts the lump sum, an MVPD earth station operator electing the lump sum would be responsible for coordinating with space station operators and installing any necessary technology upgrades at its earth station locations (rather than satellite operators) within the transition deadlines where such an upgrade is necessary to the transition. MVPD earth station operators electing the lump sum take on the risk that their lump sum will not be sufficient to install such equipment and must cover the difference to install such equipment, should it be necessary to their transition.

28. To further clarify the division of responsibilities for compression/transcoding technology upgrades (e.g., the installation and associated equipment costs for which MVPD earth station operators that elect the lump sum will be responsible)—and because the record reflects vastly different suggested approaches for such technology upgrades in the lump sum—we make clear which costs are included in the “MVPD Per Site Technology Upgrade Installation Lump Sum Payment.” We include the average, estimated cost of installing any necessary integrated receivers/decoders and transcoders (including spare equipment for sudden equipment failures) per MVPD earth station site. We recognize commenters’ concerns that compression-related technology upgrades do not directly correlate to the number of antennas at an earth station site, but instead are associated with the number of satellite transponders using higher order modulation that are received by various antennas associated with the earth station site.¹⁰⁹ Accordingly, rather than calculate installation costs on a per antenna basis, as we proposed in the *Lump Sum Comment Public Notice*, we have calculated the installation costs on a per-site basis, accounting for the average number of integrated receivers/decoders and transcoders that may be necessary at each site (based on the average number of transponders delivering video programming channels that will require upgrades), to better reflect a typical MVPD earth station transition.¹¹⁰ We also include the cost of any necessary equipment for installation, such as line cards, equipment racks, cables, and related hardware, multiplied by the probability that such equipment will be needed in the integrated receiver/decoder and

¹⁰⁶ *3.7 GHz Report and Order*, 35 FCC Rcd at 2427, para. 202.

¹⁰⁷ *Id.* at 2455, para. 293.

¹⁰⁸ *3.7 GHz Report and Order*, 35 FCC Rcd at 2427, para. 202.

¹⁰⁹ See, e.g., ACA July 2, 2020 *Ex Parte* at 2 (“[A]n MVPD earth station’s technology upgrade costs would be generally the same whether it uses one antenna to receive beams from three satellites or uses three separate antennas to receive the same three beams.”); ACA July 7, 2020 *Ex Parte* at 3 (“[S]ince one large antenna can be capable of receiving all the same programming networks as multiple smaller antennas, the number and type of antennas is not a logical way to determine the need for technology upgrades.”); Letter from Ross Lieberman, Senior Vice President of Government Affairs, ACA, to Marlene H. Dortch, Secretary, FCC, at 3 (filed July 21, 2020) (ACA July 21, 2020 *Ex Parte*) (explaining that “allocating technology upgrade costs on a per-antenna basis is an abnormal method” and that “beams (and the relevant transponders) that will be carrying programming moving to advanced compression are a better basis for determining” technology upgrade costs); Cox June 19, 2020 *Ex Parte*, Attach. at 1 (asking the Bureau to calculate technology upgrades on a “per beam” basis to account for upgrade costs associated with multi-beam dishes); ACA July 27, 2020 *Ex Parte* at 2 (arguing that technology upgrades should be calculated on a per-beam basis rather than per antenna).

¹¹⁰ Addressing technology upgrade installation costs on a per site, instead of per antenna basis will remove the inequity that would occur between single beam and multibeam antennas (i.e., one headend with five single beam antennas could be getting the same content as a single multibeam antenna looking at the same five satellites).

transcoder upgrade and replacement process for each site.¹¹¹

29. We include the estimated installation costs for technology upgrades in the lump sum amounts for *all* MVPD incumbent earth station locations because the record clearly supports that the average MVPD earth station site will require upgrade of at least some of its video programming channels.¹¹² Accordingly, we determine that installation costs for those technology upgrades constitute part of the “average, estimated costs”¹¹³ of relocating all of an MVPD earth station operator’s incumbent earth stations. Because the average MVPD earth station site would incur installation costs for compression technology upgrades, we also determine that it is unnecessary to limit the distribution of installation costs only to those MVPDs that can demonstrate that technology upgrades are necessary to their transition, as we had initially proposed in the *Lump Sum Comment Public Notice*.¹¹⁴ Because satellite operators are responsible for purchasing technology upgrade equipment and because the average MVPD incumbent earth station transitioning to the upper 200 megahertz of the C-band will incur installation costs for such equipment, verifying the need for a technology upgrade as part of an MVPD operator’s lump sum is unnecessary. As noted, we believe that including the average, estimated costs to install technology upgrade equipment in the lump sum amount for all MVPD incumbent earth stations best approximates the cost of an average MVPD incumbent earth station transition, without placing the burden of proving the need for technology upgrades on the MVPD operator. This approach will allow MVPD incumbent earth station operators to determine whether the lump sum amount is sufficient for their own transition needs, without the uncertainty created by a post-election verification process.¹¹⁵ We also note that our approach, which does not include a verification process for the installation costs of technology upgrades, addresses commenters’ concerns specific to the verification requirement proposed in the *Lump Sum Comment Public Notice*.¹¹⁶

30. Finally, we have removed the proposed “Program Source Uplink Technology Upgrades” category, including associated installation costs, from the MVPD lump sum. Based on the record and our reasoned judgment, we determine that the typical MVPD earth station transition will incur installation

¹¹¹ As explained above, we calculate the technology upgrade installation costs using a variation of an expected value approach. Where a particular cost meets the initial threshold for inclusion (to indicate that it would not be an outlier cost), we multiply the average cost by the probability that such a cost would be incurred.

¹¹² See, e.g., ACA July 7, 2020 *Ex Parte* at 6-7 (indicating that the “vast majority of MVPDs carry the programming that will be offered in higher compression, will receive such programming over the same number of beams, and will need to acquire and install the same number of IRDs as well as take other associated actions”); Intelsat Transition Plan at 48 (indicating that eight major programmers will move to higher compression, which would require their MVPD customers to install replacement integrated receivers/decoders at the headends); Cox May 14, 2020 Comments at 8 (noting that upgraded modulation and encoding techniques would require “new IRDs and transcoders—on a per channel basis—for approximately 33% of a typical MVPD’s channels”) (emphasis added).

¹¹³ *3.7 GHz Report and Order*, 35 FCC Rcd at 2427, para. 202.

¹¹⁴ See *Lump Sum Comment Public Notice* at 3-4.

¹¹⁵ Although MVPD incumbent earth station operators will not be subject to verification of the need for a technology upgrade as part of the lump sum, we note that all incumbent earth station operators’ eligibility for the particular antenna type or class of earth station for which they seek a lump sum may be subject to verification, given that earth station registrations in IBFS do not provide sufficient information to confirm that earth station operators are making accurate elections. As we explain in section II.D, *infra*, incumbent earth station operators must certify to the accuracy of information in their lump sum elections. Such information will be subject to verification by the Clearinghouse as necessary to prevent waste, fraud, and abuse.

¹¹⁶ Commenters argue, for example, that a verification requirement raises too much uncertainty for MVPD earth station operators and conflicts with the purpose of the lump sum amount, as established in the *3.7 GHz Report and Order*. See, e.g., NCTA June 15, 2020 Comments at 10-12; Cox June 15, 2020 Comments at 3-5; ACA June 15, 2020 Comments at 12-17; ACA July 2, 2020 *Ex Parte* at 2; ACA July 7, 2020 *Ex Parte* at 3-4; ACA July 27, 2020 *Ex Parte* at 2.

costs for downlink technology upgrades (i.e., integrated receivers/decoders and transcoders) rather than uplink upgrade costs (i.e., encoder and modulator equipment). Because the installation costs for uplink technology upgrades are not typical of an MVPD earth station transition and are more likely to be costs incurred at a programmer's uplink site, we do not include those costs in the MVPD lump sum amount. We would expect satellite operators or programmers (as surrogates of satellite operators, where appropriate) to purchase and install any necessary upgrades at programmer's uplink sites.

B. Updates to the Lump Sum Categories

31. We make further updates to the lump sum categories, which are included in the Lump Sum Table, to address additional information and arguments that commenters raise regarding the expected transition process. We clarify that the lump sum base payments in the Lump Sum Table refer to each operational and registered antenna or dish at an incumbent earth station site (i.e., each operational and registered antenna or dish included in an earth station IBFS registration, consistent with the requirements in the *3.7 GHz Report and Order*), with the above-described exception for MVPD technology upgrade installation lump sum claims (which are available on a per-site basis).¹¹⁷ Accordingly, an incumbent earth station operator's lump sum payments for each incumbent earth station site will be calculated by the amount listed in the Lump Sum Table for the relevant antenna multiplied by the number and type of antennas or dishes properly included in that incumbent earth station site's registration (and for MVPDs, will include the per-site technology upgrade installation amount).¹¹⁸ For

¹¹⁷ See, e.g., *3.7 GHz Report and Order*, 35 FCC Rcd at 2426, para. 201, n. 539 (“Consistent with our definition of ‘incumbent earth stations,’ we clarify that, in order to qualify for reimbursement, any antenna at an incumbent earth station must also have been operational and registered in IBFS as of the relevant dates required by the *Freeze and 90-Day Earth Station Filing Window Public Notice*.”); see also NCTA May 14, 2020 Comments at 27 (arguing that because relocation costs will be acquired per antenna, the lump sum should be “paid out for each antenna at an incumbent’s properly registered earth station facilities, not paid out per earth station facility”); ACA June 15, 2020 Comments at 7 (raising concern that the *Lump Sum Comment Public Notice* was “vague with respect to the definitions of the proposed base lump sum categories, and whether they should apply on a per antenna or per earth station basis”). The *Lump Sum Comment Public Notice*’s “Estimated Lump Sum Payments Per Earth Station” were calculated *per antenna* rather than per earth station site or per earth station registration. See *Lump Sum Comment Public Notice* at 5. While the Lump Sum Table in the Cost Catalog clarifies that the base lump sum payments are per antenna, we note that this terminology update is not a change in our approach from the *Lump Sum Comment Public Notice*.

¹¹⁸ We disagree with ACA’s suggestion that the *3.7 GHz Report and Order* precludes this approach. See Letter from Ross Lieberman, Senior Vice President of Government Affairs, ACA, to Marlene H. Dortch, Secretary, FCC, at 2 (filed June 25, 2020) (ACA June 25, 2020 *Ex Parte*). First, the *3.7 GHz Report and Order* does not define “per incumbent earth station” on a per site basis. Indeed, as we explain, language in the rules adopted in the *3.7 GHz Report and Order* suggests that reference to incumbent earth station refers, at a minimum, to a single antenna, rather than to a site with multiple antennas. Section 27.1411(b)(5), for example, says that “[a] passband filter must be installed at the site of *each incumbent earth station*.” 47 CFR § 27.1411(b)(5). A reading of this rule to suggest that only one passband filter must be installed at each registered site (with multiple antennas), rather than at each antenna, would defy logic, as passband filters are necessary for each antenna. Second, the *3.7 GHz Report and Order* directed the Bureau to establish the lump sum amounts “available per incumbent earth station” and to “identify lump sum amounts for various classes of earth stations—e.g., MVPDs, non-MVPDs, gateway sites—as appropriate.” *3.7 GHz Report and Order*, 35 FCC Rcd at 2428, para. 203 (emphasis added). Nothing in the *3.7 GHz Report and Order* suggests that the Bureau cannot establish lump sum amounts at the per antenna level for the classes of earth station that we deem appropriate. ACA’s argument that “the outcome of earth stations of the same class receiving different lump sum amounts . . . is likewise an unauthorized revision of the *3.7 GHz Report and Order*” is not supported by the text of the *3.7 GHz Report and Order* (indeed, ACA cites to its own comments for this proposition). ACA June 25, 2020 *Ex Parte* at 2 & n.7 (citing ACA June 15, 2020 Comments at 15-16). The example ACA points to in the *3.7 GHz Report and Order* that “if the average costs of relocating an incumbent earth station is \$5,000, an incumbent earth station operator with three stations could elect to receive \$15,000,” appears to be just that—an example of a possible outcome of the lump sum amounts. See *3.7 GHz Report and Order*, 35 FCC Rcd at 2427, para. 203, n. 543; see also ACA June 15, 2020 Comments at 16. Our approach is consistent with the

(continued....)

example, if an incumbent earth station registration has two registered antennas that are “receive only ES single-feed,” an incumbent earth station operator would be eligible to receive the lump sum listed in the Lump Sum Table for both registered antennas associated with that particular earth station site (or registration), although only one technology upgrade installation payment (if the earth station operator is an MVPD).

32. We decline to create additional lump sum categories for incumbent MVPD earth stations for the base amounts, as some commenters request.¹¹⁹ We believe that our approach for MVPDs addresses concerns that MVPD earth station sites incur higher costs than non-MVPD sites while staying within the requirements established in the *3.7 GHz Report and Order*. First, our inclusion of the installation costs of technology upgrades for MVPDs addresses the increased costs they are likely to incur for installing compression and modulation equipment. Second, our approach that calculates the lump sum base amounts on a per antenna approach, rather than per site without considering the number of antennas at each site, addresses MVPD operators’ concerns that they typically incur higher costs because they have more antennas than non-MVPD operators. MVPD operators’ lump sum amounts will reflect the number of antennas at each incumbent earth station site, which more accurately approximates their average estimated transition costs than a per site approach.

33. In light of concerns that MVPDs may not know which lump sum base category is appropriate for their particular earth stations,¹²⁰ we clarify some terminology used in the Cost Catalog to assist with selecting the appropriate lump sum category. Reference to “single-feed” in the Lump Sum Table refers to single polarization. Reference to “multi-feed” in the Lump Sum Table refers to dual polarization. Both single-feed and multi-feed antennas would look at one orbital slot. Reference to “multi beam” in the Lump Sum Table refers to a torus antenna that has visibility into large portions of the geo arc and can look at multiple satellites at the same time. While each incumbent earth station operator should select the most relevant lump sum category for each of its licensed or registered antennas at an incumbent earth station site, we expect that MVPDs most likely use multi-feed (dual polarization) or multi-beam (torus) antennas, whereas non-MVPDs typically are likely to use single-feed antennas (single polarization).

C. Updates to the Lump Sum Amounts

34. Commenters also raise concerns that the proposed lump sum amounts were too low, and

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3.7 GHz Report and Order’s direction: The Bureau has identified the appropriate classes of earth station based on the types of antennas and has further identified an MVPD class. The total amount “available per incumbent earth station” at each site is based on the number and type of antennas registered at each incumbent earth station site, plus the MVPD per antenna technology upgrade installation amount for MVPD operators. ACA’s argument that we can only establish a single per-site lump sum for each class—and not base that amount on the number of antennas at each earth station site—seems to elevate form over substance; it would also result in lump sum amounts that less precisely reflect the average estimated cost of transition. We agree with NCTA, which suggests that paying a lump sum cost per facility or call sign instead of per antenna “would significantly underrepresent the average costs for actually transitioning such facilities.” NCTA May 14, 2020 Comments at 27; *see also* Cox May 14, 2020 Comments at 4-5 & n. 10 (asking that lump sum payments be calculated on a per antenna basis, rather than on a per call sign basis, to better address average costs, and noting that the *3.7 GHz Report and Order* suggests that reimbursement qualification should be made on a per antenna basis) (citing *3.7 GHz Report and Order*, 35 FCC Rcd at 2426, para. 201, n.539 (“[I]n order to qualify for reimbursement, any *antenna* at an incumbent earth station must also have been operational and registered in IBFS as of the relevant dates required by the *Freeze and 90-Day Earth Station Filing Window Public Notice*.”) (emphasis added)).

¹¹⁹ *See, e.g.*, Cox June 15, 2020 Comments at 8-9; ACA June 15, 2020 Comments at 10-11.

¹²⁰ *See* ACA June 15, 2020 Comments at 7 (“The Bureau does not explain which of the proposed earth station classes it deems to be most appropriate for MVPDs, which generally have ten or more antennas at their sites. ACA Connects could not figure this out from either the names of the categories or the amounts associated with each category.”).

they identify certain cost items that they argue should be included in calculating the lump sum amounts.¹²¹ We include additional cost items in the lump sum amounts where we determine those cost items to be part of a typical transition for the relevant earth station class. For example, in response to information from commenters, we update the lump sum base amounts to include application modification fees,¹²² the cost to purchase and install new feed horns on some dishes,¹²³ as well as costs associated with system integration of modified earth stations.¹²⁴ Consistent with our lump sum calculation methodology, we multiply those average costs by the probability that a particular earth station class is likely to incur such a cost.¹²⁵ We do not always use the exact cost that commenters suggest in the calculation, but instead use the average of the reasonable cost range provided in the Cost Catalog to be consistent with our calculation method.

35. We also update the base lump sum amounts for single-feed, multi-feed, and multi-beam antennas based on additional information in the record that demonstrates the likelihood that those antennas may require repointing to a different satellite and dual illumination during the transition. First, we increase the base lump amount for single-feed antennas to account for the costs of repointing to a different satellite (including dual illumination costs), which were not previously included in the proposed lump sum amount for that class of antennas. We make this change due to information from the initial Transition Plans indicating that some single-feed antennas will incur such costs so we adjusted our assumptions based on this new information not previously available.¹²⁶ Similarly, based on information in the record, we have adjusted the lump sum amounts for multi-feed and multi-beam antennas to account for a lower percentage of those antennas needing dual illumination than we previously estimated. Comments in the record, as well as the Transition Plans, indicate that satellites delivering content to MVPD headends will largely stay in their current orbital locations or at locations currently covered by existing antennas because of coverage optimization to those orbital locations currently covered in addition to efficient repacking of content using technology upgrades.¹²⁷ This new information reveals the work that satellite operators are performing to repack content efficiently at existing orbital locations to minimize disruption on earth station operators and to speed the transition, and the information allows us to estimate more accurately the average transition for these classes of antennas.

36. In addition, we do not include all of the cost items that commenters propose in the lump sum amounts. Where we determine that a cost would not be incurred in a typical transition for a particular earth station class, we have excluded that cost item,¹²⁸ consistent with our methodology for

¹²¹ See, e.g., NCTA June 15, 2020 Comments at 4-6; ACA June 15, 2020 Comments at 6; JCLDS Comments at 2-3.

¹²² ACA June 15, 2020 Comments, Attach. at 2 (including application modification fees in their lump sum calculation).

¹²³ JCLDS June 15, 2020 Comments at 4.

¹²⁴ See e.g., NCTA May 14, 2020 Comments at 19; SES May 14, 2020 Comments at 2; ACA June 15, 2020 Comments, Attach. at 3.

¹²⁵ See *supra* para. 16.

¹²⁶ See, e.g., Intelsat Transition Plan at 14 (indicating that two satellites used for broadcast, religious, radio, and data networks will be replaced).

¹²⁷ See, e.g., Intelsat Transition Plan at 30-38 (indicating that approximately a quarter of MVPD content stations will be moved to new orbital locations); Cox May 14, 2020 Comments at 7-8 (arguing that a typical MVPD headend will have 10 antennas with one antenna needing to be repointed to a new satellite location, and may need two additional antennas to point to new satellites, which demonstrates that not more than a quarter of such antennas would need to point to new orbital locations).

¹²⁸ See, e.g., JCLDS June 15, 2020 Comments at 3 (asking for “travel costs for rural, mountainous, hard-to reach areas” in 30% of transitions).

calculating lump sum amounts, as discussed above.¹²⁹ For that reason, we decline to include the cost of replacement antennas or new additional antennas in the lump sum costs, despite the fact that some commenters' models include those costs in their proposed lump sum calculations. JCLDS, for example, includes in its proposed lump sum amount the cost of replacement antennas (including installation and new foundation work) for a small percentage of its transitions.¹³⁰ MVPD commenters such as Cox, ACA, and NCTA also suggest that additional antennas will be necessary for MVPD earth stations to point to new orbital slots with the launch of new satellites.¹³¹ In contrast, Intelsat anticipates that replacement or additional antenna feeds or antennas may be necessary "[i]n some cases" and SES indicates that, based on customer outreach it has conducted thus far, "in the vast majority of cases, an antenna is already available at the Incumbent Earth Station to receive service from the new satellite."¹³² Consistent with the *3.7 GHz Report and Order*, the lump sum amounts are "based on the average, estimated costs of relocating" incumbent earth stations.¹³³ While replacement or additional antennas may be needed in some cases to transition an earth station, we have not seen sufficient evidence that supports including such expenses in the lump sum as part of the average, estimated costs of transitioning.¹³⁴ We remind incumbent earth station operators that, where their transitions are more complex, such that the "average, estimated costs" do not reflect their particular transitions, they can choose to seek reimbursement for their actual relocation costs through the Clearinghouse, rather than elect the lump sum.¹³⁵

37. We decline to adopt PSSI Global's request to increase the lump sum amount for all temporary fixed earth stations to include the MVPD-specific technology upgrade amounts and re-engineered feed systems.¹³⁶ We note that the lump sum process is intended to address the average typical transition for different types of earth stations. Based on our reasoned judgment and the record, the cost categories and amounts that comprise the lump sum payment proposed by PSSI Global do not appear to be essential elements of the typical transportable earth station transition. Specifically, increasing the amount of a lump sum category to cover solutions that PSSI admits are "not yet even designed, built, tested and available"¹³⁷ would not be appropriate. We also clarify that, as with the other earth station types, the cost of equipment for technology upgrades are outside the scope of the lump sum process for

¹²⁹ As we explain, cost items must meet an initial threshold of likelihood that a particular antenna type or class of earth station would incur them in a typical transition before we include those costs in the lump sum calculation. *See supra* para. 16.

¹³⁰ JCLDS June 15, 2020 Comments at 4 (including costs for 3.7-meter replacement antennas and installation in its cost model).

¹³¹ Cox June 15, 2020 Comments at 8-9 (noting that "TVRO sites operated by MVPDs will need to procure and operate additional dishes to continue to receive existing C-Band services"); ACA June 15, 2020 Comments at 8 (noting the inclusion in its cost model of "three new antennas and associated equipment, repointing activities, cabling and trenching, filters and power splitters, site work, and related warranties" which it says "will be needed to look at the three additional satellites that will be positioned in new orbital slots by SES and Intelsat"); NCTA May 14, 2020 Comments at 27 (arguing that "the lump sum payment amounts should reflect, as the Cost Catalog does, that in some cases new antenna purchases will be necessitated as the result of dividing content among different satellites in different orbital slots").

¹³² Intelsat Transition Plan at 26; SES Transition Plan at 11.

¹³³ *3.7 GHz Report and Order*, 35 FCC Rcd at 2427, para. 202.

¹³⁴ Consistent with our lump sum calculation approach described above, *see supra* para. 16, the likelihood of needing replacement or new antennas for a typical transition did not meet the initial threshold for inclusion in the lump sum.

¹³⁵ *3.7 GHz Report and Order*, 35 FCC Rcd at 2427, para. 202.

¹³⁶ PSSI Global Services June 15, 2020 Comments at 2, 5.

¹³⁷ *Id.* at 3 ("Transportables should . . . be treated as 'providing MVPD operations'").

temporary fixed earth stations.

38. We also decline to designate all temporary fixed earth stations as MVPD earth stations, as PSSI Global requests.¹³⁸ It is unclear that all temporary fixed stations operate as PSSI contends and, in those limited instances where they do, the operator can choose to seek reimbursement from the Clearinghouse for its actual costs instead. In other words, to the extent that parties such as PSSI Global find the lump sum amount for temporary fixed earth stations to be insufficient for their particular transition,¹³⁹ they can choose not to receive the lump sum and can instead seek reimbursement for their actual, reasonable costs for each earth station that must be transitioned.¹⁴⁰ Finally, to the extent PSSI Global raises concerns regarding protections for transportables and fixed FSS earth stations in the context of its comments to the *Lump Sum Comment Public Notice*,¹⁴¹ we note that such arguments are outside the scope of our consideration for the Cost Catalog and the lump sums contained therein.

D. Lump Sum Election Process

39. In this Public Notice, we establish the process for electing lump sum payments.¹⁴² Consistent with the *3.7 GHz Report and Order*, incumbent earth station owners must make their lump sum payment election no later than August 31, 2020.¹⁴³ We remind incumbent earth station owners that they “must indicate whether each incumbent earth station for which” they elect “the lump sum payment will be transitioned to the upper 200 megahertz in order to maintain C-band services or will discontinue C-band services.”¹⁴⁴

40. Because IBFS registrations do not contain sufficient information to determine the classes of earth stations/antennas that are registered at each earth station site or to determine whether an earth station site is an MVPD earth station, we require earth station owners to certify that the information they provide in their lump sum election—including the antenna type and class of earth station—is accurate to the best of their knowledge. Such information will be subject to verification as part of the Clearinghouse’s role to prevent waste, fraud, and abuse.¹⁴⁵

41. Incumbent earth station owners choosing the lump sum election must file in IB Docket No. 20-205, with the following information for each of that operator’s incumbent earth station sites:

¹³⁸ *Id.* at 5. Likewise, we decline requests that we determine at this time whether individual earth station operators qualify as MVPDs, as Globecast requests. *See* Globecast June 15, 2020 Comments at 2-5 (asking to be considered an MVPD for purposes of the lump sum). Such a determination is outside the scope of this Public Notice.

¹³⁹ *See* PSSI Global Services June 15, 2020 Comments at 4 (“[A]ny accurate Lump Sum pricing forecasts for temporary fixed transportable earth stations would appear to be very difficult to calculate at this point, if not impossible, no matter the methodology.”).

¹⁴⁰ PSSI Global Services says that it finds “it difficult to take the same approach (lump sum vs. reasonable relocation cost) for each category of earth station that we own based on this proposal because they are so unique and different.” *Id.* at 2. We remind PSSI Global Services, however, that the *3.7 GHz Report and Order* establishes that an incumbent earth station operator’s lump sum election “must apply to all of each earth station operator’s earth stations in the contiguous United States.” *3.7 GHz Report and Order*, 35 FCC Rcd at 2427, para. 202.

¹⁴¹ PSSI Global Services June 15, 2020 Comments at 2.

¹⁴² *See 3.7 GHz Report and Order*, 35 FCC Rcd at 2428, para. 203; 47 CFR § 27.1419.

¹⁴³ *See 3.7 GHz Report and Order*, 35 FCC Rcd at 2428, para. 203; 47 CFR § 27.1419. Because 30 days after release of this Public Notice, August 29, 2020, falls on a Saturday, pursuant to the Commission’s computation of time rule, lump sum payment elections will be due no later than Monday, August 31, 2020. *See* 47 CFR § 1.4.

¹⁴⁴ *See 3.7 GHz Report and Order*, 35 FCC Rcd at 2428, para. 203; *see also* 47 CFR § 27.1419.

¹⁴⁵ *See, e.g., 3.7 GHz Report and Order*, 35 FCC Rcd at 2447, para. 259 (establishing Clearinghouse as a measure to “prevent waste, fraud, and abuse with respect to reimbursement distributions”).

1. Licensee/Registrant/Applicant Name,
 2. Earth Station Callsign,
 3. Site ID,
 4. Antenna ID,
 5. Number of antennas associated with that Antenna ID,
 6. Site address,
 7. GPS coordinates of the earth station,
 8. File Number(s) of current authorization and/or pending application,
 9. Confirmation that the earth station meets the definition of incumbent earth station under 47 CFR §§ 27.1411(b)(3) and 25.138(c), including indication of whether earth station appears on the International Bureau's final list of eligible earth stations,¹⁴⁶
 10. Category of lump sum election for each registered antenna at that registered earth station site (e.g. Receive Only ES Single-feed; Receive Only ES Multi-feed; Small Multi-beam (2-4 beams) ES, etc.),
 11. Whether earth station site is an MVPD earth station site (to claim the per-site technology upgrade installation amount),
 12. Total lump sum amount claimed for that earth station (calculated by the number of registered antennas at that incumbent earth station multiplied by the relevant lump sum base amount, plus technology upgrade installation amount if MVPD), and
 13. Whether the incumbent earth station will be transitioned to the upper 200 megahertz in order to maintain C-band services or will discontinue C-band services.
42. The lump sum election must include a certification from the incumbent earth station owner (if an individual) or a duly authorized representative with authority to bind the station, which certifies to the following:
1. That the information contained in the lump sum election is true and accurate to the best of the incumbent earth station owner (if an individual) or duly authorized representative knowledge;
 2. That all earth stations for which the lump sum is being elected will not have ceased operation more than 90 days before the deadline for the lump sum election;
 3. That, if the incumbent earth station owner intends to continue to receive content from a satellite operator after the transition at any of its earth station antennas, it accepts responsibility for undertaking the necessary transition actions in accordance with the timelines set forth in the satellite operators' Transition Plans;

¹⁴⁶ See *International Bureau Releases Preliminary List of Incumbent Earth Stations in the 3.7-4.2 GHz Band in the Contiguous United States*, Public Notice, DA 20-703, at 1-2 (IB July 6, 2020). We note that the International Bureau will have released the final list of incumbent earth stations prior to the election deadline.

4. That the incumbent earth station owner agrees to coordinate with the relevant space station operator as necessary to complete the transition;¹⁴⁷
5. An irrevocable release of claims for reimbursement for actual reasonable relocation costs from the Relocation Payment Clearinghouse, eligible satellite operators, or video programmers; and
6. An irrevocable release of claims against the payor and/or Commission with respect to any dispute about the amount received.

Filing Requirements. Incumbent earth station owners electing the lump sum must file their elections on or before the date indicated in the “Lump Sum Election Process” section of this document. All filings must reference IB Docket No. 20-205. Elections may be filed using the Commission’s Electronic Comment Filing System (ECFS).

- Electronic Filers: Comments may be filed electronically using the internet by accessing the ECFS: <https://www.fcc.gov/ecfs/>.
- Paper Filers: Parties who choose to file by paper must file an original and one copy of each filing.

Filings can be sent by commercial courier or by the U.S. Postal Service. All filings must be addressed to the Commission’s Secretary, Office of the Secretary, Federal Communications Commission.

- Commercial deliveries (other than U.S. Postal Service Express Mail and Priority Mail) must be sent to 9050 Junction Drive, Annapolis Junction, MD 20701.
- U.S. Postal Service First-Class, Express, and Priority mail must be addressed to 445 12th Street, SW, Washington, DC 20554.
- **Effective March 19, 2020, and until further notice, the Commission no longer accepts any hand or messenger delivered filings. This is a temporary measure taken to help protect the health and safety of individuals, and to mitigate the transmission of COVID-19. See *FCC Announces Closure of FCC Headquarters Open Window and Change in Hand-Delivery Policy*, Public Notice, DA 20-304 (March 19, 2020). <https://www.fcc.gov/document/fcc-closes-headquarters-open-window-and-changes-hand-delivery-policy>**
- **During the time the Commission’s building is closed to the general public and until further notice, if more than one docket or rulemaking number appears in the caption of a proceeding, paper filers need not submit two additional copies for each additional docket or rulemaking number; an original and one copy are sufficient.**

People with Disabilities: To request materials in accessible formats for people with disabilities (braille, large print, electronic files, audio format), send an e-mail to fcc504@fcc.gov or call the Consumer & Government Affairs Bureau at 202-418-0530 (voice, 202-418-0432 (tty)).

Additional Information. For further information regarding this Public Notice, please contact Susan Mort, Wireless Telecommunications Bureau, at Susan.Mort@fcc.gov or 202-418-2429.

¹⁴⁷ We note that the necessary degree of coordination with the relevant space station operator may well be minimal under certain circumstances (e.g., if the earth station owner exercises its discretion to switch to a non-satellite-based method of receiving transmissions or to shut down its operations altogether).

ATTACHMENT

3.7 GHz TRANSITION FINAL COST CATEGORY SCHEDULE OF POTENTIAL EXPENSES AND ESTIMATED COSTS

July 30, 2020

TABLE OF CONTENTS

I. ABOUT THIS CATALOG

This cost category schedule (Catalog) contains descriptions of the potential expenses and estimated costs that (1) incumbent space station operators and incumbent earth station operators may incur as a result of the required transition out of the 3700-4000 MHz band into the 4000-4200 MHz band in the contiguous United States¹ and (2) that Fixed Service operators may incur as a result of transitioning out of the entire 3700-4200 MHz (C-band) into one of the following bands: 5925 – 6425 MHz; 6525 – 6875 MHz; 6875 – 7125 MHz; 10,700 – 11,700 MHz; 17,700 – 18,300 MHz; 19,300 – 19,700 MHz; and 21,200 – 23,600 MHz. While the Catalog is relatively comprehensive, it does not include every expense for every situation, nor is it an exhaustive list of all expenses that may potentially qualify for reimbursement.

RKF Engineering Solutions, LLC assisted the Wireless Telecommunications Bureau with developing this Catalog after the release of the Commission's *Order* in March 2020. This Catalog is subject to the provisions of the *Order* and the rules adopted therein.² To the extent there are any discrepancies between the requirements adopted in the *Order* or the relevant rules and this Catalog, the *Order* and the rules govern. The categories and costs contained in the Catalog are intended to serve as a reference guide and are not intended to identify the specific reimbursable expenses incurred by individual satellite, earth station, and fixed service operators.

Individual operators may incur only some of the expenses listed in the Catalog, depending upon the operator's existing equipment and the particular transition changes that the entity must make. Some of the expenses will apply only in limited situations, such as, for example, satellite operators that only need to move a service from the lower 300 megahertz of the C-band to the upper 200 megahertz. The Catalog specifies presumptively reasonable costs on a per unit basis. Further, while the cost items below are grouped in tables based on the likelihood that the cost item may be needed for a particular transition type, we acknowledge that some transitions may need cost items from different tables.

Supply and demand constraints may impact future costs, but this Catalog does not attempt to account for future costs.

¹ Note that such expenses and costs incurred extend to earth stations located outside of the contiguous United States to the extent it can be demonstrated that the system modifications for which they seek reimbursement are necessary as a direct result of the C-band transition. See *Expanding Flexible Use of the 3.7 to 4.2 GHz Band*, GN Docket No. 18-122, Report and Order and Order of Proposed Modification, 35 FCC Rcd 2343, 2428, para. 204 (2020) (*Order*). In addition, earth station operators electing the lump sum do not need to continue to operate on the C-band but can elect to transition their operations to another mechanism (e.g. fiber) or to discontinue operations.

² See, e.g., *Order* at 2422-30, paras. 193-210 (establishing guidelines for compensable costs).

II. SATELLITE OPERATOR COSTS

The transition will require eligible space station operators to incur new capital costs and short-term operating expenditures. Reimbursable space station operator costs are limited to the actual, reasonable relocation costs associated with clearing the lower 300 megahertz of the band while ensuring continued operations for their customers.³ Thus, reimbursable costs could include all reasonable engineering, equipment, site, and FCC fees, as well as any reasonable, additional costs that eligible space station operators serving earth stations in the contiguous United States may incur as a result of relocation.⁴

A. EXPECTED COST TO REPACK EXISTING SATELLITES

Clearing the lower 300 megahertz will entail ensuring that current services offered across 500 megahertz of the 3700-4200 MHz band, are efficiently transitioned to the upper 200 megahertz. Most of this clearing effort is operator labor, so a range of costs for this labor is provided in Table II-A-1 below on a per satellite basis inclusive of load balancing.

Table II-A-1: Satellite Repacking	Range of Estimated Cost (\$)
Engineering and Execution Labor	150,000 – 350,000

B. IN-ORBIT DELIVERY OF NEW SATELLITE(S)

While some satellite operators may be able to transition their operations above 4000 MHz with existing satellite capacity, some operators may need to launch additional satellites to complete the transition. The following table includes the expected range for total sum of costs for the in-orbit operational delivery of satellite(s). The costs are inclusive of spacecraft, launch, financing, mission operation, spacecraft-specific ground costs, program management/oversight, and insurance. Costs are broken out by a single launch or a shared launch.

Table II-B-1: Expected Total Costs for Satellite(s) Delivered In-Orbit	Range of Estimated Cost (\$)
2 Tandem Launched C-Band Space Satellites	240M – 768M
1 Single Launched C-Band Satellite	120M – 450M

In section II-B above and in section II-C below, the low estimates are based upon satellite operator procurement of multiple, identical launch vehicles, where spacecraft are assumed to be standard C-band payloads with minimal spacecraft redundancy to satisfy basic mission objectives and an adequate number of amplifiers to clear the 300 megahertz of spectrum per satellite operator requirements. High

³ Order at 2422, para.194.

⁴ Order at 2422, para.193.

estimates assume a significantly accelerated build/launch timeline to offer satellite operators the ability to begin testing and verification of ground relocation equipment over the satellite in under 24 months and/or the potential to “backstop” other satellite builds as a fail-safe to delays. High estimates also assume additional technical spacecraft margins for reliability and redundancy and propulsion systems that accommodate rapid mission transfers to final orbital positions.

C. SPACE SEGMENT COST BREAKOUT

In this section, the costs from Table II-B-1 are broken down further to account for the procurement, launch, and financing of individual satellites.

1. Spacecraft

The table below presents the costs associated with building a new satellite.

Table II-C-1: Satellite Procurement of 1 Satellite	Range of Estimated Cost (\$)
1 C-Band Satellite for Replacement/Diversification	89M – 205M
Satellite Procurement Program Management (per satellite)	5M – 8M

2. Launch Costs

Cost of launches for the replacement satellites varies greatly. Contributions to this range include reusability of the rocket, development of multi-satellite stacks for the rockets, and the launch-on-demand requirements for meeting the timelines.

Table II-C-2: Launch Costs	Range of Estimated Cost (\$)
Launch Per Satellite (Dual Launch)	36M – 83M
Launch Per Satellite (Single Launch)	62M – 140M

3. Other Potential Costs

Other potential costs include financing (spacecraft and/or launch), insurance, legal, and supplemental engineering. Satellite operators may seek reimbursement for the costs of acquiring financing for clearing costs that are directly attributable to relocation. The estimated costs below are on a per satellite basis.

Table II-C-3: Consulting Fees	Range of Estimated Cost (\$)
Satellite System Engineering Planning	25,000 – 75,000
Coordination of New Satellite	35,000 – 125,000

Table II-C-4: Attorney Fees	Range of Estimated Cost (\$)
Prepare and File FCC Forms	1,500 – 5,000
Prepare and File ITU Forms	5,000 – 20,000

Table II-C-5: Filing Fees	Estimated Cost (\$)
FCC Satellite Application Filing Fee	136,930

Table II-C-6: Finance & Insurance	Range of Estimated Cost (\$)
Cost to Finance Satellite	3.5M – 11M
Cost to Finance Launch	2M – 5M
Insurance	15M – 30M

D. RELOCATION PROGRAM MANAGEMENT

In addition to the space station operator expenses outlined elsewhere in the Catalog, space station operators will also expend efforts to coordinate the relocation of customers and repacking of transponders. An overall program manager for transition logistics and execution may be necessary for each satellite operator as provided in the table below.

Table II-D-1: Program Management	Range of Estimated Cost (\$)
Cost to Manage Satellite Relocation Program	200,000 – 400,000

III. EARTH STATION MIGRATION AND FILTERING COSTS

Earth station transitions may vary widely depending on the actions of the satellite operator, the age of the earth station antenna(s), the location and use of the earth station site,⁵ and other factors. Earth station filtering will be a uniform transition task necessary to prevent interference from flexible-use operations below 3980 MHz. Beyond that, the transition may consist of expenses such as retuning or repointing an antenna, up to and including replacement of equipment that cannot be reasonably transitioned (e.g., replacing receivers, amplifiers, or other equipment that due to age or other factors must be replaced to allow the transition).

The satellite operator is expected to transition its services in the lower 300 megahertz to the upper 200 megahertz of the 3700-4200 MHz band. This effort will require, on the part of the satellite operator, frequency planning and coordination with the earth station operators on the move timing and logistics, and the purchase and installation of passband filters in all primary and redundant antenna receive paths for those earth station operators not electing the lump sum (see Section E below). Note that although the satellite operator would also perform analyses of optimum carrier assignment for the frequency move to include carrier-to-interference ratio (C/I) analysis, potential increases in effective isotropic radiated power (EIRP), satellite power availability, and other radio frequency (RF) performance factors, these analyses are included in the repacking modification costs detailed in Table II-A-1. This section details expenses that satellite or earth station operators might incur from transitioning service to the upper 200 megahertz of the band. Many of the costs described in the Catalog will be incurred on a per-antenna basis. An earth station operator may require migration activities for multiple antennas at a single or multiple sites. Estimates for equipment installation are assumed to include acceptance or benchmarking testing.

Earth station migration “includes any necessary changes that will allow the earth stations to receive C-band services” throughout the transition period and after the applicable relocation deadline once satellite operators “have relocated their services into the upper portion of the band.”⁶

A. ANTENNA FILTERING/RETUNING/REPOINTING

First, we address the costs associated with a simple filtering, retuning, or repointing of various earth station antennas because we believe the majority of antennas can be migrated through these simple mechanisms. In section B below, we address the costs for more complex and expensive migrations that will involve replacing equipment or migrating complex gateway facilities.

⁵ We note that an earth station site refers to an incumbent earth station location with one or more registered antennas receiving or receiving/transmitting signals to a satellite.

⁶ Order at 2426, para. 201.

We note that costs are specified per antenna unless noted otherwise, but for earth station sites with more than one antenna, some of the cost items could be used once to transition multiple antennas (e.g., rental of bucket truck or tree removal). Further, some items such as travel could be applied once if the work is accomplished in one trip or more than once if different antennas have to be transitioned on different trips. Accordingly, the tables are set up to be applied flexibly, but the Clearinghouse has the discretion to determine the reasonableness of costs submitted for reimbursement and to audit entities that receive reimbursements.⁷ Tables III-A-1 and III-A-2 outline costs for filtering, retuning, and repointing antennas.

Table III-A-1: Retuning to Frequency in 4.0-4.2 GHz	Range of Estimated Cost (\$)
Passband Filter	400 – 900
Passband Filter Installation (for two low-noise block converters (LNBS))	300 – 1,350
Passband Filter Installation in Remote Locations (per site)	1,600 – 2,000
C-band Phase Locked Loop (PLL) LNB (for two LNBS)	500 – 1,100
Perform Retuning	400 – 700
Acquisition of Ladder or Bucket Truck Rental	500 – 5,500
Retrofit a Dual-Feed onto a Single-Feed Antenna	1,000 – 2,200
Retrofit a Triple-Feed onto a Single-Feed Antenna	1,500 – 3,300
Fiber Transmitter	1,500 – 3,000
Fiber Receiver	1,500 – 3,000
Fiber Optic Chassis	1,500 – 3,300
Chassis Frame Controller	1,000 – 2,200
Travel Costs (per site and per trip)	150 – 1,500

⁷ Order at 2447-78, paras. 260-62.

Table III-A-2: Repointing to a Different Satellite	Range of Estimated Cost (\$)
Perform Repointing (includes labor for repointing and small changes in waveguide or new intrafacility link runs)	400 – 3,000
Low Noise Amplifier/Block Downconverter	250 – 600
Upgrade/Change Polarization	300 – 600
Install a Spare Portable or Trailer-Mounted Antenna	2,000 – 3,300
Rental of Spare Portable or Trailer Mounted Antenna (per month)	3,000 – 5,700
Filter for Seeded ⁸ Antenna	400 – 900
Filter Installation in Seeded Antenna	600 – 1,100
Filter Installation in Spare Antenna (if seeding antenna is not needed)	600 – 1,100
Initiate Operations Via Dual Illumination (with seeded or spare antenna) (per antenna)	500 – 12,000
Planning for Dual Illumination	10,000 – 30,000
Dual Illumination for Repointing (per dual illumination uplink per month) ⁹	10,000 – 28,000
Third-Party Uplink Costs for Dual Illumination (per transponder)	75,000 – 125,000
Replace Cabling from Antenna to Headend	1,000 – 3,000
Travel Costs for Rural, Mountainous, Hard-to-Reach Areas (per trip)	150 – 1,500
Labor Fee for Installations or Emergency Situations (per hour)	300 – 800

Table III-A-3: Earth Station Migration Project Costs	Range of Estimated Cost (\$)
Project Management (including technical support, engineering, administration, accounting, and legal fees) (per site)	400 – 1,000
System Integration of Modified Antenna with Other Gateway Components ¹⁰ (per antenna)	600 – 1,600
Application Fee for New Earth Station License	2,985
Application Fee to Modify Existing Earth Station License	210
Third Party Frequency Coordination and Report	3,000 – 4,000

⁸ When a spare antenna is not available, the seeded antenna refers to the antenna utilized during dual illumination while transitioning out of the band.

⁹ Includes end-to-end verification.

¹⁰ Verification testing to confirm system end-to-end operation.

Table III-A-4: Gateway - RF Uplink Chain	Range of Estimated Cost (\$)
<i>RF Uplink Chain for Limited Motion Antenna Configuration</i>	
Solid State Power Amplifier (cost per polarization) Note: At least two polarizations expected	75,000 – 340,000
Block Upconverter (BUC)	35,000 – 45,000
Fiber System	45,000 – 55,000
RF Distribution	25,000 – 35,000
<i>RF Uplink for Extended/Full Performance Antenna Configuration</i>	
Travelling Wave Tube Amplifier	75,000 – 260,000
BUC	35,000 – 45,000
Fiber System	25,000 – 35,000
RF Distribution	25,000 – 35,000
<i>Supporting Equipment</i>	
Uplink Filter	500 – 1,500
Modulators	30,000 – 45,000
Transport Stream Switches	40,000 – 55,000
Waveguide Switches	5,000 – 10,000
RF Load	2,500 – 8,000
Dehydrators	6,000 – 12,000
Customized Waveguide Sections	1,000 – 10,000
Power Meter	12,000 – 18,000

Table III-A-5: Gateway - RF Downlink Chain	Range of Estimated Cost (\$)
<i>RF Downlink Chain for Limited Motion Antenna Configuration</i>	
Block Downconverter (BDC)	35,000 – 45,000
Fiber System	45,000 – 55,000
RF Distribution	15,000 – 25,000
<i>RF Downlink Chain for Limited Motion Antenna Receive Only Configuration</i>	
Fiber System	45,000 – 55,000
RF Distribution	15,000 – 25,000
<i>RF Downlink Chain for Extended/Full Performance Antenna Configuration</i>	
BDC	35,000 – 45,000
Fiber System	45,000 – 55,000
RF Distribution	15,000 – 25,000

Table III-A-6: Terrestrial Link	Range of Estimated Cost (\$)
Core Network Components - Routers, Switches, Server (per component)	1,000 – 30,000
TS Switching and Failover	40,000 – 50,000
Platform and Network Installation/Testing	9,000 – 17,000
RF Routing/Distribution	25,000 – 40,000
RF Over Fiber System	20,000 – 30,000
Bandwidth Augments to Existing Circuits	60,000 – 300,000
Trenching/Boring for New Fiber Paths	250,000 – 400,000
Circuits	240,000 – 1,500,000

B. EQUIPMENT COSTS

The earth station migration and filtering costs are likely to vary based on the type of antennas installed at each earth station location. The following tables include equipment costs for receive-only antennas (single feed and multi-feed), bi-directional antennas (e.g., transmit-receive), and temporary fixed antennas. Near full-arc antennas refer to non-parabolic multibeam antenna types (e.g., torus). In most instances, the existing equipment and infrastructure will continue to be usable and will not require replacement, but in some instances, one or more of these basic components may need to be replaced to facilitate the transition.

1. Receive Only Antennas

Table III-B-1: Receive Only Antenna Equipment	Range of Estimated Cost (\$)
<i>Single-Feed System</i>	
3.7m Antenna with a Single-Feed System (2 PLL LNBS, Pipe mount hardware, installation and instruction manuals) (per unit)	4,000 – 6,600
3.8m - 4.2m Antenna with a Single-Feed System (2 PLL LNBS, Pipe mount hardware, Installation and Instruction manuals) (per unit)	8,000 – 12,000
4.5m Antenna with a single-feed system (2 PLL LNBS, Pipe mount hardware, installation and instruction manuals) (per unit)	9,000 – 16,400
<i>Dual-Feed System</i>	
3.7m Antenna with a Dual-Feed System (4 PLL LNBS, Pipe mount hardware, installation and instruction manuals) (per unit)	5,000 – 7,700
3.8m - 4.2m Antenna with a Dual-Feed System (4 PLL LNBS, Pipe mount hardware, installation and instruction manuals) (per unit)	9,000 – 13,100
4.5m Antenna with a Dual-Feed System (4 PLL LNBS, Pipe mount hardware, installation and instruction manuals) (per unit)	10,000 – 17,500
<i>Triple-Feed System</i>	
3.7m Antenna with a Triple-Feed System (6 PLL LNBS, Pipe mount hardware, installation and instruction manuals) (per unit)	5,500 – 8,200
3.8m - 4.2m Antenna with a Triple-Feed System (6 PLL LNBS, Pipe mount hardware, installation and instruction manuals) (per unit)	9,500 – 13,700
4.5m Antenna with a Triple-Feed System (6 PLL LNBS Pipe mount hardware, installation and instruction manuals) (per unit)	10,500 – 18,000
<i>Supporting Equipment and Installation</i>	
Antenna Installation or Move with Foundation (includes foundation materials, equipment rental and logistics/freight) Note: The low estimate is for non-penetrating mount installation, and the high estimate for concrete foundation; assumes a concrete pad and pier, general conditions, surveyor, anchor bolts placement, grounding, A/C outlets (quantity of two - Utility and Technical)	5,000 – 30,000
Antenna Installation for Large Antenna (4.5m – 13m antennas)	8,000 – 55,000
Foundation Work for 4.5m Antenna	34,000 – 40,000
Foundation Work for 5.6m Antenna	37,000 – 43,000
Foundation Work for 7.3m Antenna	40,000 – 48,000
C-Band Feedhorn Replacement	150 – 600
Single Feed Assembly	150 – 300
Dual Feed Assembly	1,000 – 2,200
Triple Feed Assembly	1,500 – 3,300
C-Band Feedhorn Installation (for single, dual, or triple-feed)	300 – 3,000
Additional Cable & Other Spare Equipment for Install (cable length dependent)	500 – 3,300

Shipment of Antenna Equipment (size of antenna and shipping distance dependent)	500 – 5,500
Trenching for Cable for Antenna Installation (if needed)(up to 150ft max for new trench and new cabling; note, cables that need to be buried may be different and more expensive than over ground cabling and will often need conduits or armor)	1,000 – 14,000
Mount Upgrade Options (includes antenna relocation kit, anchor bolt kit and/or new jack screws)	1,000 – 15,000
Snow Cover (3.7m)	500 – 1,100
De-Icing System	4,000 – 12,000
Lightning Protection Kit	1,000 – 2,500
Tree Removal and/or Pruning (including local permits)	500 – 5,000
Landscaping Service in Accordance with Zoning Ordinance (City/County) Coordination	5,000 – 25,000
Travel Costs to non-CONUS Earth Station Site (CONUS to Hawaii or Alaska, where required as part of the transition)	5,000 – 10,000
Installation for TV Receive Only Earth Station on Vessels (filter replacement and rebalancing; used for network monitoring of services destined to vessels, but are at fixed locations)	1,500 – 3,000
Fencing Requirements (120 linear ft, 6ft high, double gate)	6,000 – 9,000
Daily Travel Costs by Vehicle (1 hour driving each way only on low end; driving, eating, one-night stay on high end)	250 – 750

Table III-B-2: Receive Only Antenna - Complete Systems	Range of Estimated Cost (\$)
<i>Small Near Full-Arc¹¹ Multibeam Antenna: Replacement Only</i>	
Multibeam Antenna (4.5m equivalent)	70,000 – 80,000
Cable Junction Box	2,000 – 2,500
Full Reflector Heating System	20,000 – 25,000
Lightning Protection Kit	1,000 – 1,500
Reflector Antenna Installation	9,000 – 10,500
<i>Small Near Full-Arc Multibeam Antenna: Complete System</i>	
Multibeam Antenna (4.5m equivalent) and Standard Mount	125,000 – 140,000
Foundation Kit	2,000 – 9,000
C-Band Dual Polarity Feed Assembly (per feed)	1,500 – 2,500
C-Band PLL LNB (per feed)	500 – 1,100
Cable Junction Box	2,000 – 2,500
Full Heating System	20,000 – 25,000
Lightning Protection Kit	1,000 – 1,500
Full System Installation	9,000 – 10,500
Shipping and Handling	15,000 – 17,000
<i>Large Near Full-Arc Multibeam Antenna: Complete System</i>	
Multibeam Antenna (6m equivalent) and Standard Mount	400,000 – 475,000
Foundation Kit	3,500 – 4,500
C-Band Dual Polarity Feed Assembly (per feed)	1,500 – 20,000
C-Band PLL LNB (per feed)	500 – 1,100
Cable Junction Box	4,000 – 4,500
Full Heating System	55,000 – 65,000
Lightning Protection Kit	2,000 – 2,500
Full System Installation	70,000 – 250,000
Shipping and Handling	25,000 – 30,000
<i>Limited Motion Antennas (LMA): Complete System</i>	
6.5m Linear LMA Antenna System (includes 2-Port receive-only feed system, 3 axis motorization Next-Generation Controller (NGC) along with recommended antenna accessories such as maintenance platform/ladder kit, lightning protection, antenna grounding, NGC environmental system)	150,000 – 175,000
7.2m Linear LMA Antenna System (includes 4-Port feed system, 3 axis motorization NGC along with recommended antenna accessories such as maintenance platform/ladder kit, lightning protection, antenna	230,000 – 245,000

¹¹ These antennas are not a full parabolic shape (e.g., torus). This antenna type is applicable for, but not limited to, complex multichannel video programming distributor.

grounding, NGC environmental system)	
13.5m Linear LMA Antenna Systems (includes 4-Port feed system, 3 axis motorization NGC along with recommended antenna accessories such as maintenance platform/ladder kit, lightning protection, antenna grounding, NGC environmental system)	720,000 – 735,000
<i>Supporting Equipment</i>	
Passband Filter	400 – 900
Multibeam Bubble Cover Kit	1,000 – 3,300
Feed Peaking Kit	500 – 1,100
C-Band Ortho Mode Transducers	1,000 – 2,200
C-Band Antenna Feed Assembly (per feed)	1,500 – 2,200
2 Cables with 4 Connectors (cable length dependent)	500 – 3,300

2. Bi-Directional Antennas

Table III-B-3: Bi-Directional Antenna Equipment	Range of Estimated Cost (\$)
2.4-3.0m Tx/Rx Antenna Terminal	2,500 – 18,000
3.7m Tx/Rx Antenna Terminal	10,000 – 30,000
4.5m Tx/Rx Antenna Terminal	25,000 – 45,000
6m Tx/Rx Antenna Terminal	60,000 – 200,000
BUC 2W to 80W (outdoor unit)	2,000 – 20,000
BUC 100W to 300W (outdoor unit)	20,000 – 40,000
Duplication of Hub Platforms for Transition - Single Site	200,000 – 1.5M
Additional Line Cards for Transition	6,000 – 10,000
Additional Modems for Transition	2,000 – 8,000
Additional Chassis	3,000 – 10,000
Core Network Components - Routers, Switches, Server (per component)	1,000 – 30,000
Platform and Network Installation/Testing	9,000 – 17,000
Shipping Antenna Equipment	10,000 – 30,000
Antenna Installation or Move with Foundation (includes foundation materials, equipment rental, and logistics/freight)	10,000 – 120,000

3. Temporary Fixed Antenna

Table III-B-4: Temporary Fixed Antenna Equipment	Range of Estimated Cost (\$)
4.5m Transmit Antenna	25,000 – 45,000
Shipping & Installation	10,000 – 15,000
Mobile Truck Rental (cost per day)	4,000 – 5,000
Upconverter/Modulator	50,000 – 75,000
High Power Amplifier	75,000 – 170,000

4. Gateway and Large Aperture Point to Point Systems

The following table, III-B-5, lists items related to gateway or large aperture point-to-point systems including teleport equipment costs associated with common configurations for antenna sizes, e.g., 7.3m and 13m antennas with limited motion, extended performance, and full performance capability. Telemetry, Tracking, and Control (TT&C) consolidation costs are covered in section C below. 7.3m limited motion antennas (LMA) are anticipated to be used for Remote Monitoring System monitoring and also receive-only configurations; 13m LMAs are anticipated to be used for TT&C and Commercial Traffic; 13m Extended Performance Antennas (EPAs) are anticipated to be used for TT&C Rover and site backup; and 13m Full Performance Antennas (FPAs) are anticipated to be used for TT&C Rover and, where applicable, transfer orbit support services. The antenna is considered to be procured as a package from a single vendor per system, where major components include the antenna pedestal, hub, reflector, sub-reflector, low noise amplifier/low noise block downconverter (LNA/LNB), where LNB is used if the system is used for receive-only, and tracking/drive system. A vendor contract is assumed for the antenna hardware and installation services.

Table III-B-5: Gateway Equipment	Range of Estimated Cost (\$)
<i>7.3m LMA</i>	
7.3m LMA	550,000 – 700,000
7.3m LMA Installation	150,000 – 250,000
7.3m LMA System Integration	250,000 – 300,000
7.3m LMA Receive Only System Integration	80,000 – 120,000
<i>9m LMA</i>	
9m LMA	650,000 – 900,000
9m LMA Installation	200,000 – 350,000
9m LMA System Integration	150,000 – 250,000
<i>11m LMA</i>	
11m LMA	750,000 – 900,000
11m LMA Installation	250,000 – 400,000
11m LMA System Integration	150,000 – 250,000
<i>13m LMA</i>	
13m LMA	950,000 – 1.7M
13m LMA Installation	350,000 – 500,000
13m LMA System Integration	250,000 – 300,000
<i>13m Extended Performance Antenna (EPA)</i>	
13m EPA	1,550,000 – 1,950,000
13m EPA Installation	350,000 – 500,000
13m EPA System Integration	250,000 – 300,000
<i>13m Full Performance Antenna (FPA)</i>	
13m FPA	3,600,000 – 3,800,000
13m FPA Installation	450,000 – 600,000
13m FPA System Integration	250,000 – 300,000

<i>Supporting Equipment</i>	
Network Routers	55,000 – 200,000
Program Management for Antenna Installation	60,000 – 210,000

C. TT&C CONSOLIDATION COSTS

The following table outlines the estimated costs associated with consolidating the TT&C sites.

Table III-C-1: Consolidation of TT&C	Range of Estimated Cost (\$)
13m Antenna System (full motion, calibrated) - Single Antenna	1.5M – 2M
Antenna Installation - Single Antenna	600,000 – 733,000
Timing System	36,000 – 105,000
Baseband Unit	100,000 – 600,000
Test Loop Translator	25,000 – 75,000
Digital Interfacility Link to Existing Teleports for Translation to Baseband	700,000 – 800,000
Upgrades to Satellite Ground Control System (per satellite)	200,000 – 1,500,000
Land/Facility Acquisition (includes cost of civil works)	500,000 – 2.5M
Site Infrastructure Buildout (includes cost of civil works)	18M – 35M

D. POTENTIAL TOTAL COSTS – ANTENNA REPLACEMENT

While it is not the case for all entities, some entities may have to replace an entire antenna system either due to a need to relocate the antenna or because the system is too old or incompatible with a simpler upgrade. Maximum costs are based on like-for-like replacements. An overall rollup range is provided and supporting information is provided above.

Table III-D-1: Potential Total Costs for Antenna Systems	Range of Estimated Cost (\$)
Receive Only Earth Station Antenna Reflector Replacement	39,000 – 210,000
Receive Only Earth Station Complete Antenna System ¹² Replacement	180,000 – 880,000
Bi-Directional Earth Station Antenna System Replacement Cost	40,000 – 1.9M
Temporary Fixed Earth Station Antenna System Replacement Cost	164,000 – 310,000
Gateway Antenna Replacement Cost	1.1M – 4.8M

¹² Includes near full-arc multibeam antennas.

E. LUMP SUM PAYMENT TRANSITION

The Commission established the option for earth station operators to accept a lump sum amount “based on the average, estimated costs” of relocating their earth stations.¹³ The lump sum option allows operators to transition to the upper 200 megahertz themselves or to move to alternative technologies (e.g., fiber) on their own without seeking reimbursement for actual costs of the transition. The Commission outlined that entities selecting this choice would get the average, estimated costs of relocating all of the entity’s incumbent earth stations to the 4000-4200 MHz band, and would not be able to seek additional funds if the actual expenses to transition (including transitioning to alternative technologies) were more.

We note for clarification purposes that the “Base Lump Sum Payments” referenced in Table III-E-1 are calculated per antenna and apply to each antenna specifically identified and included within an earth station registration listed in the International Bureau Filing System (IBFS). Incumbent earth station operators that elect the lump sum will be eligible to receive the Base Lump Sum Payments identified in Table III-E-1 for each registered antenna included in an IBFS registration for an incumbent earth station site. For clarification of terminology used below, a Receive Only ES Single-Feed Antenna means an antenna with a single polarization receiving a signal from a single satellite; a Receive Only ES Multi-Feed Antenna means an antenna that receives two polarizations from the same satellite effectively doubling the available bandwidth; a Multi-beam ES Antenna means an antenna that can receive signals from multiple orbital slots simultaneously.

For each type of earth station antenna outlined below (e.g., ranging from simple receive-only antennas to gateway antennas) the lump sum includes the estimated reasonable costs of upgrades/modifications (excluding compression upgrades, which are discussed below) that the average earth station antenna in that category would need for the transition.¹⁴ The cost of the modification used for the calculation of the Base Lump Sum Payments was the average cost of the range from the various components of this Catalog. Depending on the type of antenna, different modifications or component changes were used based upon an expectation of the typical range of changes that would be necessary for this type of earth station transition. Some cost elements like soft costs, travel, and filtering apply to all types of earth station transitions, whereas monthly rental antennas, fiber transmitters, and other cost elements only apply to more complex earth station transitions. For example, all earth station antennas will require new filters. Some antennas, however, will require new LNBS that will contain the new passband filter. Accordingly, a determination was made based upon the comments and our judgement as to the percentage of each and then factored into the average estimated cost.

¹³ *Order* at 2427, para. 202. While reimbursement of expenses on an itemized basis is available for earth stations located outside of the contiguous United States to the extent they can demonstrate that the system modifications for which reimbursement is sought are necessary as a direct result of the C-band transition, the lump sum payment is not an option for earth stations outside of the contiguous United States. *Id.* at 2428, para. 204 n.550.

¹⁴ *Order* at 2428, para. 203 & n.547.

The lump sum payment for Multichannel Video Programming Distributor (MVPD) earth stations will include the “MVPD Per Site Technology Upgrade Installation Lump Sum Payment,” which is calculated based on the average costs of installing compression/encoding equipment (i.e., integrated receivers/decoders and transcoders) for an average MVPD earth station site, and includes the estimated cost of labor and basic components (e.g., line cards, equipment rack, and cables) to install that equipment where necessary to the transition. As with the “Base Lump Sum Payment” calculation, the “MVPD Per Site Technology Upgrade Installation Lump Sum Payment” accounts for the probability that certain installation costs would be incurred at an MVPD earth station site. The “MVPD Per Site Technology Upgrade Installation Lump Sum Payment” does not include the cost of compression/encoding equipment or the cost to ship that equipment to the MVPD earth station sites.

Table III-E-1: Estimated Lump Sum Payments for Incumbent Earth Stations	Average Estimated Cost (\$)
<i>Base Lump Sum Payments (Per Registered Antenna)</i>	
Receive-Only Earth Station (ES) Single-feed Antenna	8,948
Receive-Only ES Multi-feed Antenna	16,997
Small Multi-beam (2-4 beams) ES Antenna	42,062
Large Multi-beam (5+ beams) ES Antenna	51,840
Gateway ES Antenna (bi-directional)	20,854
Temporary Fixed ES Antenna (e.g., mobile Electronic News Gathering trucks)	3,060
<i>Additional Lump Sum Payment for MVPD Earth Stations (Payment Available Per MVPD Earth Station Site Registered in IBFS)</i>	
MVPD Per Site Technology Upgrade Installation Lump Sum Payment	47,598

IV. FIXED SERVICE COSTS

As the *Order* states, “[i]ncumbent licensees of point-to-point Fixed Service links that relocate out of the 3.7-4.2 GHz band by December 5, 2023, shall be eligible for reimbursement of their reasonable costs based on the well-established ‘comparable facilities’ standard used for the transition of microwave links out of other bands.”¹⁵ Costs are stated on a “per link” relocation cost, where a discounting is associated with temporary fixed links (e.g., Electronic News Gathering and similar transportable fixed operations) versus permanent fixed links.

Depending on a Fixed Service operator’s new frequencies, it may be possible to retune existing transmitters/receivers to operate on new frequencies rather than replace them. Whether retuning is feasible depends on a number of factors, including the type of equipment, the frequency range(s) for which component parts are designed, the length of the path, and whether replacement parts and manufacturer support are available. In some cases, C-band Fixed Service equipment includes the capability to support the extended C-band (i.e., 5850-6725 MHz), which could potentially reduce the relocation effort required for some Fixed Service operators. In many cases, replacement may be the preferred option if the cost of retuning exceeds the cost of a new transmitter or the performance degradation is too severe or technically infeasible. Regardless of whether an operator chooses to retune or replace the equipment, the associated filters are channel-specific and must be replaced to accommodate any channel change.

The range of costs associated with Fixed Service relocation can vary widely from as little as \$2,000 for a retune in cases where existing equipment support the new frequencies outside the 3700-4200 MHz band to as much as \$290,000 for a complete like for like replacement of all equipment on both sides of the link for a 12-channel-or more system and significant tower and engineering labor. Historical data support an average link replacement cost of approximately \$185,000. A collection of costs associated with a simple retune are provided in Section IV-A below followed by more complicated relocation cost estimates.

A. RETUNING ONLY RELOCATION

We anticipate that a simple retune (e.g., to the extended C-band in cases where this is possible) will fall in the ranges found in Table IV-A-1. This includes the labor associated with the retune and any consulting, attorney, and FCC fees as defined in Section IV-B, where the low end of the range assumes only filing fees and the high end assumes electromagnetic analyses and other support (e.g. consultants/attorneys).

Table IV-A-1: Fixed Service Retune Only Total Costs	Range of Estimated Cost (\$)
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¹⁵ See *Order* at 2465, para. 326.

Permanent Fixed Link Relocation Cost	2,000 – 25,000
Temporary Fixed Link Relocation Cost	1,500 – 15,000

B. PROJECT MANAGEMENT, CONSULTING, ATTORNEY, AND FCC COSTS/FEES

Table IV-B-1: Fixed Service Relocation Project Costs	Range of Estimated Cost (\$)
Project Management of the Transition, if Needed (cost per hour)	62 – 200
Address Transition Timing and Coordination Issues with Other License Holders, if Needed	850 – 2,750
Prepare and/or Review Reimbursement Form	250 – 2,750
Comprehensive Study/Verification of Link Performance and Reliability, if Needed for New Electromagnetic Environment (Note - Engineering /Electromagnetic Environmental Studies are commensurate with relocation activity complexity and the amount of analyses required for new band access.)	2,750 – 19,500

Table IV-B-2: FCC Filing Fees (adjusted biennially)	Range of Estimated Cost (\$)
New, Renewal, or Renewal/Modification FCC Form 601/159 - Application Payment/Fee (per call sign)	305
New, Renewal, or Renewal/Modification FCC Form 601/159 - Regulatory Payment/Fee (per call sign)	250
Special Temporary Authorization Request	140
Extension of Construction Authority FCC Form 601/159 - Application Payment/Fee (per call sign)	110

Table IV-B-3: Consulting/Attorney Fees	Range of Estimated Cost (\$)
Prepare and File Engineering Section of FCC Form 601, Schedule I	1,000 – 5,250
Prepare and File Engineering Section of FCC Form 601, Schedule K (Notification of Completion of Construction)	500 – 2,250
Prepare and File Special Temporary Authorization	1,000 – 3,500

C. SITE/PROJECT COSTS FOR SAME TOWER EQUIPMENT REPLACEMENT

In most cases, replacement of Fixed Service equipment may be necessary to relocate to a new frequency band. In these cases, Fixed Service operators may seek to limit new tower construction by instead performing a like-for-like replacement of equipment that *must* be replaced. This subsection addresses costs associated with project and equipment replacement costs occurring on the towers where existing links reside and thus no costs are associated with new land access and/or a new tower. Costs are broken out by equipment costs, installation/pathing/testing costs, and radio frequency (RF) engineering required to replace both ends of a point-to-point microwave link in Tables IV-C-1, IV-C-2, and IV-C-3, respectively.

Table IV-C-1: Fixed Service Equipment for Single Microwave Path (2 ends of a point-to-point microwave link)	Range of Estimated Cost (\$)
Channel Filters	450 – 2,100
Indoor Radio Pair	6,000 – 26,000
Modem Pair	650 – 5,500
Microwave Antennas - 2 Parabolic Dish Antennas	2,880 – 24,200
Outdoor Units - 2 Radios and Enclosures	1,000 – 7,750
Microwave Network Management System Equipment (server and redundant server hardware)	20,000 – 30,000
Miscellaneous Materials (e.g., waveguide, dehydrator, grounding, DC to DC Converter, Racks, PDUs, Disposal, Delivery, Storage and Handling)	3,000 – 25,000

Table IV-C-2 Installation/Pathing /Testing Costs	Range of Estimated Cost (\$)
Microwave Changeout Per Elevation (one site, each hop is two sites) (includes feedlines and sweep testing)	28,000 – 38,000
Microwave Pathing	12,000 – 16,000
Radio, Modem, and Cabling	5,000 – 7,000
Microwave Dish Antenna	10,000 – 15,000
Waveguide, Jumpers, and Connectors	3,000 – 5,000
Dehydrator System	1,000 – 1,500
DC Breaker Installation	400 – 600
New Ground Bar for Waveguide	700 – 1,000
New Ice Bridge from Shelter to Tower	6,000 – 8,000
Dish Alignment	2,500 – 3,500
Radio Acceptance Testing	4,000 – 6,000

Table IV-C-3 RF Engineering Costs	Range of Estimated Cost (\$)
Perform Engineering Study for New Operating Frequencies and Antenna & RF Equipment Development/Selection	2,000 – 15,000
Comprehensive Coverage Verification Via Field Study, if Needed	21,000 – 84,200

D. ADDITIONAL SITE/PROJECT COSTS ASSOCIATED WITH NEW SITE(S)

In cases where a new site is required either for lease or purchase and access to an additional tower, existing or new, is necessitated due to no other options being available for legacy Fixed Service systems to relocate to new spectrum bands, this section identifies costs that might be incurred in association with Fixed Service migration. Costs are grouped in terms of site acquisition costs, architecture/engineering costs, survey costs, environmental costs, and structural engineering costs.

Table IV-D-1 Site Acquisition Costs	Range of Estimated Cost (\$)
Search Ring for New Viable Tower or Ground Space, Confirm Zoning and Permitting Process, Site Candidate Application in Existing Asset, Lease Package or Ground Lease	7,500 – 10,000
Obtain Building Permits from Local Zoning Authorities (cost of preparation, submission and prosecution of necessary forms or applications)	1,500 – 6,000
Obtain Local Permits Other Than for Zoning (cost of preparation, submission, and prosecution of necessary forms or applications)	500 – 2,500

Table IV-D-2 Architecture/Engineering Costs	Range of Estimated Cost (\$)
Civil Site Visit & Lease Exhibit (local site for 4 hours including travel time and no report)	1,000 – 1,500
Zoning Drawings	950 – 1,250
Construction Drawings (CDs) - Co-Location (per carrier)	1,500 – 2,500
Lease Exhibit Revisions	250
CD Revisions (major changes, i.e., compound shift or access road shift)	1,500
Power Utility Coordination	750 – 5,000
Telco Utility Coordination	750 – 5,000
Gas Utility Coordination	750 – 5,000
Building Permit Submittal (not including jurisdiction fees)	1,000 – 1,250
Perform Engineering Study for New Operating Frequencies and Antenna & RF Equipment Development/Selection	2,000 – 15,000
Comprehensive Coverage Verification Via Field Study, if Needed	21,000 – 84,200
RF Exposure Measurements (for sites where post-construction measurements have customarily been required or conducted)	3,150 – 21,050

Table IV-D-3 Survey Costs	Range of Estimated Cost (\$)
Survey & 1-A Note: additional fees may be incurred for access over 500' long \$1/ft beyond 500'	2,500 – 4,500
Title Review	500 – 600
Construction Staking	1,000 – 2,000
Survey - Additional Access Road	1/ft beyond 500'
Survey Revisions (major change, i.e., compound shift or access road shift)	1,500

Table IV-D-4 Environmental Costs	Range of Estimated Cost (\$)
Environmental Site Visit Phase I Environmental Site Assessment (ESA)	1,900 – 4,500
National Environmental Policy Act (NEPA) Section 106 Environmental Review	2,000 – 6,300
Desktop Scrub	350 – 400
Non-Ionizing Electromagnetic Radiation (NIER) Letter	1,250
Geotechnical - Soil Boring and Report (assumes 1 site visit, 1 report stamped by an engineer and 1 test bore hole)	3,000 – 6,000
Environmental Assessment (if triggered by NEPA/Section 106 or for certain structures over 450 feet) (cost in addition to NEPA Review)	5,260 – 10,520

E. POTENTIAL TOTAL COSTS - FIXED SERVICE

An expected total cost on a “per link” basis is provided below for both sides of a point-to-point microwave link. Maximum costs are based on like-for-like replacements of 12-channel-or-more systems.

Table IV-E-1: Fixed Service Expected Total Costs (2 sides of a point-to-point microwave link)	Range of Estimated Cost (\$)
Retune Permanent Fixed Link Relocation Cost	2,000 – 25,000
Retune Temporary Fixed Link Relocation Cost	1,500 – 15,000
Replacement - Permanent Fixed Link Relocation Cost	30,000 – 290,000
Replacement - Temporary Fixed Link Relocation Cost	15,000 – 150,000

V. TECHNOLOGY UPGRADES

Multiple activities are understood to be required to clear the lower 300 megahertz of spectrum in the 3700- 4200 MHz band, inclusive of repacking via load balancing across existing satellites, the deployment of new satellites, and the installation of new receiver/decoder/encoder devices that incorporate compression technologies.

Compression/multiplexing approaches and related technologies are not considered to either improve or degrade performance of a link. Not all earth station links will require compression in order to clear the lower 300 megahertz. Further, the costs associated with new transcoding equipment at the transmit/uplink site and integrated receiver/decoder devices at the receive site can be expensive. Therefore, new encrypt/encode/compress and decode/decrypt/decompress equipment will only be needed where such equipment is reasonably necessary for the transition. However, if one side of the link (e.g. the transmit/uplink) is replaced then so too must the other (e.g. the downlink). The reimbursement for and distribution of both the compression and decompression equipment is anticipated to flow through the satellite operators (in cooperation with programmers) and is typically not part of earth station costs (except for labor for installing said equipment, and necessary equipment associated with installation). In this way, the satellite operators are both responsible and accountable for the successful repacking of their operations into the upper 200 megahertz.

Costs associated with compression equipment are included in the table below. Operators are responsible for justifying the number of pieces of equipment they need to completely repack into the upper 200 megahertz.

Table V-A-1: Uplink Technology Upgrades	Range of Estimated Cost (\$)
Project Management (per uplink location)	150,000 – 250,000
Shipping and Installation (per earth station site)	30,000 – 75,000
Equipment Maintenance (per uplink location) (per month)	1,500 – 7,500
High Power Amplifier Equipment	75,000 – 170,000
Encoding / Statmux Equipment (per transponder) (may include Encoder Hardware, Encode/Mux Software, Encryption Systems, Transport Stream Switching, Integrated Receiver/Decoder Management Systems, TS Switching and Failover, and Core Network Components (routers, switches, server))	275,000 – 1.31M
Modulation and Coding Equipment (per transponder) (may include Modulators, Upconverters, Redundancy Switches, Test and Measurement, Waveguide Sweeper (Leak Detection) and Test Loop Translator)	50,000 – 85,000

Table V-A-2: Downlink Technology Upgrades	Range of Estimated Cost (\$)
Project Management Allowance (per earth station site)	500 – 1,000
Shipping (per earth station site)	800 – 8,200
Installation (per transponder)	600 – 900
Equipment Maintenance (per earth station site) (per month)	25 – 170
<i>Integrated Receiver / Decoders (per unit)</i>	
Transcoder	5,000 – 10,000
Multi-channel decoder	9,000 – 24,000
Demodulators/RF Analysis Tools	25,000 – 75,000
RF Over Fiber System	20,000 – 35,000
A/V QC/TS Analyzer	20,000 – 35,000
Multi-Viewers	25,000 – 50,000
L-Band Distribution (Splitters/Combiners)	1,000 – 10,000