

Expire Before Launch: Will Lack of Launch Capacity Stall the Future of the LEO Satellite Industry?

- **Introduction**

The significant growth in the satellite industry and increased demand for satellite services have driven rival satellite operators to request authorization to deploy more satellites. Since 2017, the U.S. Federal Communications Commission (“FCC”) has granted licenses for the deployment of more than 17,000+ Low Earth Orbit (“LEO”) satellites. Summit Ridge Group’s analysis shows that the number of satellites approved for launch could exceed 31,000 at the end of 2030. To ensure timely use of satellite authorizations, the ITU, as well as national authorities such as the FCC in the U.S., have BIU¹ deadlines. However, launch capacity has not increased in proportion to new satellite authorizations. There is simply not enough launch capacity to launch all authorized satellites. The disconnect between authorized satellites that must be launched by specific dates and the lack of available launch capacity threatens to disrupt the industry and create significant harmful downstream consequences.

- **Launch Costs Have Rapidly Dropped, Spurring Demand**

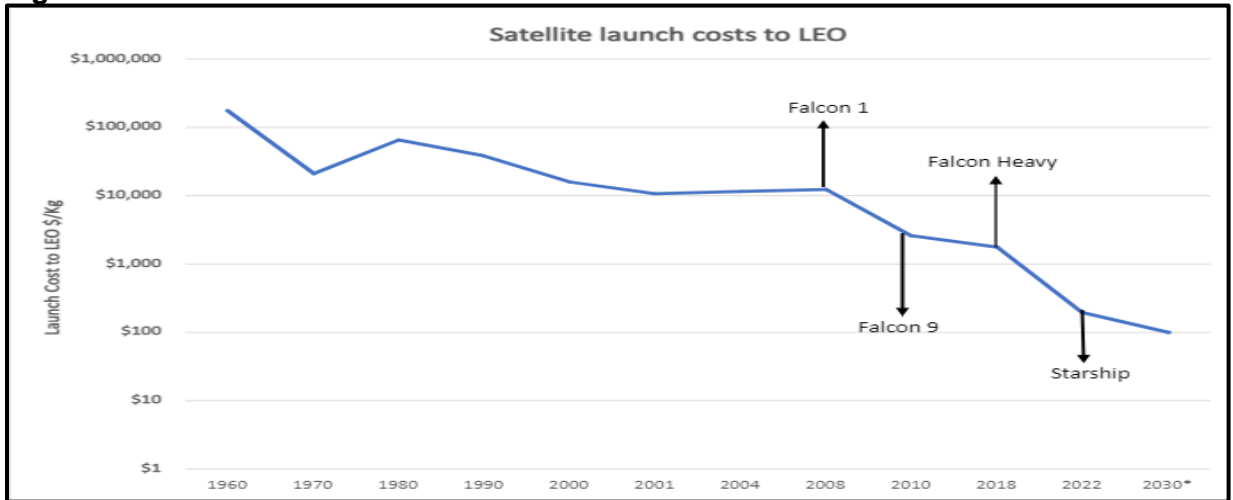
Part of the increase in satellite demand is a result of falling launch costs. LEO satellite launch costs decreased from \$12,000 - \$13,000 USD per kilogram in 2008-2012 to just \$1,500 USD in 2022 when the SpaceX Falcon Heavy became available.² With the arrival of SpaceX’s Starship, satellite launch costs may decrease further to \$100 per kilogram by the end of 2030.³ This industry-wide decrease in satellite launch costs is primarily driven by SpaceX’s reusable rockets that make launches more efficient compared to launches using non-reusable launch vehicles. Figure I below shows satellite launch cost trends since 1960.

¹ BIU is the acronym for Bringing Into Use.

² Cost for Space Launch to Low Earth Orbit- Aerospace Security Project, Aerospace Security, September 1, 2022, accessed August 14, 2023, <https://aerospace.csis.org/data/space-launch-to-low-earth-orbit-how-much-does-it-cost/>.

³ Kenneth Chang, “Highlights from SpaceX’s Scrubbed Starship Rocket Launch Attempt,” The New York Times, April 20, 2023, accessed August 14, 2023, <https://www.nytimes.com/live/2023/04/17/science/spacex-starship-launch/>.

Figure 1: Satellite Launch Cost Trend.



Source: Aerospace Security Project⁴, and Summit Ridge Group, LLC Analysis.

Note: Launch costs are adjusted and normalized with 2022 figures. The analysis includes adjustments and estimates for normalized payload cost to LEO.

- **Rapid Expansion of the LEO Satellite Industry**

In addition to reduced launch costs, enhancements in manufacturing technologies and streamlined supply chains are also driving growth LEO satellite growth. In particular, lower costs have arguably made mega-constellations for broadband economically viable and are attracting major players. Starlink, OneWeb, and Amazon have pending applications with the FCC to potentially deploy thousands of satellites.

As of 2023, more than 7,500 satellites were in LEO, medium Earth orbit (“MEO”), or Geostationary orbit (“GEO”).⁵ Of the 7,500 currently operating satellites, more than 5,928 are LEO satellites. The number of announced LEO satellite constellations increased from 100 in 2019 to 300 as of 2023.⁶

Northern Sky Research (NSR) forecasts that the launch pipeline will exceed 33,000 satellites by 2030.⁷ Other industry observers report that satellite operators have ambitious plans for more than 65,000 additional satellite deployments after 2030.⁸

⁴ Cost for Space Launch to Low Earth Orbit- Aerospace Security Project, Aerospace Security, September 1, 2022, accessed August 14, 2023, <https://aerospace.csis.org/data/space-launch-to-low-earth-orbit-how-much-does-it-cost/>.

⁵ Satellite Database, Union of Concerned Scientists, accessed August 14, 2023, <https://www.ucsusa.org/resources/satellite-database>.

⁶ Expectations versus Reality: Commercial-Satellite Constellations, McKinsey & Company, April 14, 2023, accessed August 14, 2023, <https://www.mckinsey.com/industries/aerospace-and-defense/our-insights/expectations-versus-reality-commercial-satellite-constellations>.

⁷ Sarah Halpin, “NSR’s Global Satellite Manufacturing & Launch Report Projects \$633 Billion Market by 2031,” NSR, September 7, 2022, accessed August 14, 2023, <https://www.nsr.com/nsrs-global-satellite-manufacturing-launch-report-projects-633-billion-market-by-2031/>.

⁸ Space Launch: Are We Heading for Oversupply or a Shortfall?,” McKinsey & Company, April 17, 2023, accessed August 14, 2023, <https://www.mckinsey.com/industries/aerospace-and-defense/our-insights/space-launch-are-we-heading-for-oversupply-or-a-shortfall/>.

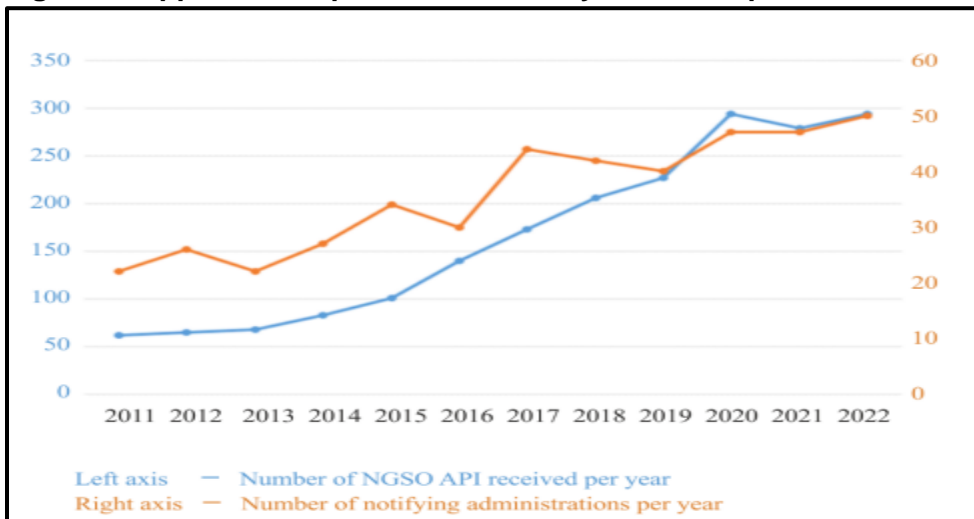
- ITU and FCC BIU Limits and Approvals for Several Large LEO Constellations.

The ITU coordinates and regulates the worldwide frequency spectrum. The Radiocommunication Sector (“ITU-R”) and its executive arm, the Radiocommunication Bureau (BR), regulate radiocommunication services, spectrum, and satellite orbits.⁹ Satellite operators must have ITU authorization to deploy satellites into orbit before launching satellites. Following ITU’s approval, satellite operators are subject to obtaining authorization from local regulatory bodies, for example, the FCC in the U.S.

In order to ensure fair use of the satellite frequency spectrum, operators must meet BIU deadlines set by both ITU and local regulators. For large LEO constellations, the ITU allows a period of seven(7) years for the satellite operator to deploy and operate the satellite operating in the requested satellite spectrum. After this period, the satellite operator must launch 10% of authorized satellites within two years, 50% within five years, and 100% within seven years. This provides a total timeframe of fourteen (14) years from the date of receipt for satellite operators.

ITU has approved many satellite constellations in the last few years. The key factor behind this is the increased number of applications to the ITU being authorized. Figure 2 below shows the number of applications to ITU for getting NGSO satellite spectrum authorization.

Figure 2: Approved/Proposed Satellites by Satellite Operators



Source: ITU¹⁰

Along with these BIU limits by ITU, satellite operators are subjected to separate BIU limits imposed by local spectrum regulators that may be tighter than the ITU deadlines. In the U.S, for example, once the FCC approves a satellite to operate within a specific spectrum band, operators must follow CFR Article 25.164(b) (i.e., the FCC’s BIU deadlines), which requires

⁹ ITU-R: Managing the Radio-Frequency Spectrum for the World, ITU, accessed October 12, 2023, <https://www.itu.int/en/mediacentre/backgrounders/Pages/itu-r-managing-the-radio-frequency-spectrum-for-the-world.aspx>.

¹⁰ ITU/UN tech agency, “Handbook on Small Satellites - ITU Hub,” ITU Hub, October 12, 2023, accessed October 12, 2023, <https://www.itu.int/hub/publication/r-hdb-65-2023/>.

that 50% of approved satellites be deployed within six years, and 100% of approved satellites be deployed within nine years. Failure to comply with these deadlines could result in canceling a satellite operator's spectrum license in the U.S.

Regulatory bodies like the ITU and the FCC in the U.S. have contributed to a significant increase in demand for launch capacity by approving applications and authorizing thousands of satellites. Figure 3 below provides detailed insights into proposed and approved satellites from leading operators serving in U.S. markets and the ITU's and FCC's deadlines to launch, deploy, and operate these satellites.¹¹

¹¹ In general, the FCC grants applications to satellite operators to construct, deploy, and operate the proposed satellites using specific frequency bands. The FCC uses the term "launch" to signify the launch and deployment of an approved satellite and operating satellite at an assigned frequency. For example, FCC Document "FCC-18-161A1," states that "SpaceX must launch 50 percent of the maximum number of proposed space stations, place them in the assigned orbits and operate them in accordance with this grant no later than November 19, 2024, and must launch the remaining space stations necessary to complete its authorized service constellation, place them in their assigned orbits, and operate them in accordance with the authorization no later than November 19, 2027." This highlights the FCC guidelines for launching the satellite, deploying it in an assigned orbit, and operating it within the assigned spectrum band.

Figure 3: Approved/Proposed Satellites by Satellite Operators.

Constellation	Company	Status	Frequency Bands	No. of Satellites	FCC BIU Deadlines for Launch	ITU BIU Deadlines(Estimated)
Project Kuiper	Amazon	Approved	Ka-Band	3,236	i) 50% of the satellites by July 30, 2026. ii) 50% of the remaining by July 30, 2029. ¹²	i) Initial satellite deployment by 2026. ii)10% satellites by 2028, 50% by 2031, and 100% by the end of 2033. ¹³
Starlink	SpaceX	Active and Approved/With Pending Launch.	Ku, Ka-Band, V-Band	11,925	Ku and Ka-Band i) 50% by December 1, 2028, and the rest 50% by December 1, 2031. ¹⁴ V-Band ii) 50% by November 19, 2024. iii) rest 50% by November 19, 2027. ¹⁵	Ku and Ka-Band i) Initial satellite deployment by 2021. ii)10% satellites by 2026, 50% by 2031, and 100% by the end of 2028. ¹⁶ V-Band: Initial satellite deployment by 2026. ¹⁷ ii)10% satellites by 2029, 50% by 2031, and 100% by the end of 2034
OneWeb	OneWeb	Active and Approved/With Pending Launch	Ku, Ka-Band, V-Band	2,000	Ku/Ka-band: 50% by June 2023.100% by June 2026(estimated). ¹⁸ V band:50% by August 26, 2026, Remaining until August 26, 2029. ¹⁹	Ku and Ka-band: i)Initial satellite by 2019. ii)10% by 2021. ii)50% by 2024. iii)100% by 2026 (estimated) ²⁰ . Q/V band: i) Initial satellite by July 2023. ²¹ ii) 10% by 2025. ii) 50% by 2028 iii) 100% by 2030. (estimated)
Telesat- V-BAND NGSO	Telesat	Approved	V-Band	117	50% by November 19, 2024, the deadline for the rest 50% is November 19, 2027. ²²	i) Initial satellite deployment by 2024. ii)10% satellites by 2026 and 50% by 2029. iii) 100% by the end of 2031. ²³
Boeing	Boeing	Approved	V-band	147	50% by November 2, 2027, the deadline for the rest 50% is November 2, 2030. ²⁴	Initial satellite deployment by 2027-2028 (estimated).
Lightspeed	Telesat	Planned	Ka-Band	198	No deadlines have been announced yet.	i) Initial satellite deployment by 2029. ii)10% satellites by 2031, 50% by 2034. iii) 100% by the end of 2036. Telesat requested an ITU extension in the BIU deadline. ²⁵
ASTRA	ASTRA	Proposed	Ka-Band	13,600	No deadlines have been announced yet.	ITU filing/authorization details are not yet disclosed.
Total				31,233²⁶		

Source: FCC and Summit Ridge Group, LLC Analysis.

¹² FCC, “FCC ORDER AND AUTHORIZATION,” July 2020, (paragraph 67), <https://docs.fcc.gov/public/attachments/FCC-20-102A1.pdf>, accessed August 14, 2023.

¹³ ITU E-Submission of Satellite Network Filings, March 2019, accessed October 16, 2023, <https://www.itu.int/itu-r/space/asreceived/publication/displaypublication/8716>.

¹⁴ FCC, “FCC ORDER AND AUTHORIZATION,” December 2022, (paragraph 137) <https://docs.fcc.gov/public/attachments/FCC-22-91A1.pdf>. accessed August 14, 2023.

¹⁵ FCC, “FCC ORDER AND AUTHORIZATION,” November 2018, (paragraph 34), <https://docs.fcc.gov/public/attachments/FCC-18-161A1.pdf>, accessed August 14, 2023.

¹⁶ Space Services Department (SSD) - SNL Part B - Query Result, ITU, accessed October 16, 2023, https://www.itu.int/net/ITU-R/space/snl/bresult/radvance.asp?sat_type=C&sat_name=STEAM-1&sel_satname=STEAM-1&plan_id=-.

¹⁷ Space Services Department (SSD) - SNL Part B - Query Result, ITU, accessed October 16, 2023, https://www.itu.int/net/ITU-R/space/snl/bresult/radvance.asp?sat_type=C&sat_name=USASAT-NGSO-3M&sel_satname=USASAT-NGSO-3M&plan_id=-.

¹⁸ FCC FACT SHEET OneWeb Market Access Grant, FCC, June 1, 2017, accessed October 16, 2023, https://transition.fcc.gov/Daily_Releases/Daily_Business/2017/db0601/DOC-345159A1.pdf.

¹⁹ FCC, “FCC ORDER AND DECLARATORY RULING,” August 2020, (paragraph 33), <https://docs.fcc.gov/public/attachments/FCC-20-117A1.pdf>, accessed August 14, 2023.

²⁰ Peter B. De Selding, “Q&A with Brian Holz, OneWeb’s Director of Space Systems,” SpaceNews, January 23, 2023, <https://spacenews.com/qa-with-brian-holz-director-of-oneweb-space-systems/>.

²¹ Peter B. De Selding and Peter B. De Selding, “ITU Approves 8-Month Deadline Extension for OneWeb to Deploy Q/V-Band Payload on SpaceX Launch,” Space Intel Report, July 8, 2022, <https://www.spaceintelreport.com/itu-approves-8-month-deadline-extension-for-oneweb-to-deploy-q-v-band-payload-on-spacex-launch/>.

The FCC usually takes two to three years to review an application to obtain a spectrum license for satellite use. As indicated earlier, satellite operators who obtain an FCC license must adhere to the FCC's deployment deadlines. FCC has BIU deadlines that mandate that 50% of approved satellites (i.e., satellites authorized to use FCC-licensed spectrum) be deployed within six(6) years and 100% of approved satellites within nine(9) years, with non-compliance penalties, including potential license cancellations. Based on the number of approved or proposed satellites, Summit Ridge Group forecasts that a cumulative total of 31,000+ satellites will need to be deployed by the end of 2030 (see Figure 2 above). Almost half of these 31,000+ authorized satellites have deployment deadlines between 2027 and 2030.

In addition to the 31,000+ satellites to be launched by the end of 2030, another 3,000 to 4,000 satellites may need to be launched annually between 2024 and 2030 to replace satellites at the end of their useful lives. Thus, the total number of expected LEO satellites in the launch queue could range between 50,000 and 55,000 by the end of 2030.²⁷ This number is based on the number of ITU or FCC-approved satellites, the number of satellites requested by satellite operators, and the number of replacement satellites. Some variations in potential satellite launch numbers could exist based on the lifespan of currently active satellites and changes in the satellite constellation by operators. This number of satellites in the launch queue raises substantial concerns about the availability and capacity of launch vehicles.

- **Launch Capacity Constraints Preclude Meeting BIU Dates**

The demand for LEO satellite launch capacity is increasing. Based on our analysis of the number of satellites to be launched and the approximate launch mass of each satellite, Summit Ridge Group predicts that total launch demand in the short term (i.e., 2023 to 2027) will remain at approximately 13,000,000 Kg or 13 Metric Kilotons while long-term demand (i.e., 2023 to 2030) could be more than 26,000,000 Kg or 26 Metric Kilotons.

However, the number of launch vehicles with medium to heavy capacity has not kept up with the demand for satellite launch services. This shortage in launch capacity has created problems for satellite operators who need to launch and deploy their LEO satellites to meet strategic or FCC deadlines. Currently, satellite operators have two choices for launching their satellites: (i) SpaceX's Falcon 9 and (ii) SpaceX's Falcon Heavy. Launch service providers such as ULA, Arianespace, and Mitsubishi Heavy Industry have limited satellite launch

²² FCC, "FCC ORDER AND DECLARATORY RULING," November 2018, (paragraph 24), <https://docs.fcc.gov/public/attachments/FCC-18-163A1.pdf>, accessed August 14, 2023.

²³ Space Services Department (SSD) - SNL PART B, n.d., https://www.itu.int/net/ITU-R/space/snl/bresult/radvanceall.asp?sel_satname=CANSAT-LEO-V.

²⁴ FCC, "FCC ORDER AND AUTHORIZATION," November 2021, (paragraph 54), <https://docs.fcc.gov/public/attachments/FCC-21-115A1.pdf>, accessed August 14, 2023.

²⁵ Telesat Requests ITU Launch Extension, Advanced Television, August 10, 2022, accessed October 16, 2023, <https://advanced-television.com/2022/08/10/telesat-requests-itu-launch-extension/>.

²⁶ The estimated number of satellite launches is based on SRG's research on FCC-approved satellite/satellite constellations as of July 2023 and the number of additional satellites proposed by leading satellite operators. The quantity may change based on further modifications by satellite operators and the FCC approvals.

²⁷ To estimate the number of satellites in the launch queue, SRG has added the total estimated approved/proposed satellites (as mentioned in Figure 2), with additional deployments between 2024 to 2030 that might be required for replacing existing satellites at the end of their useful life (typically five years). Based on the detailed analysis and further research SRG predicts a total satellite launch figure in the 50,000 to 55,000 range.

capacity since their current launch vehicles are scheduled for retirement at the end of 2025. Figure 4 below presents additional information regarding LEO launch capacity.

Figure 4: Current Launch Vehicle Capacity and Availability.

LAUNCH VEHICLE	COMPANY	NOTES	LAUNCH CAPACITY TO LEO (IN KG)
<u>Available</u>			
Falcon 9	SpaceX	Reusable and Only Available Alternative for Near Term Launches	22,800
Falcon Heavy	SpaceX	Reusable and Only Available Alternative for Near Term Launches	63,800
<u>Available with limited capacity / Will Retire by 2025</u>			
ULA Atlas V	ULA	Usage is Limited and Sold to Amazon	18,810
Ariane 5	Arianespace	Will Retired by 2024, Available Launch capacity purchased	20,000
H-IIA (Mitsubishi Heavy Industry)	Mitsubishi Heavy	Will Retired by 2024, Available Launch capacity purchased	15,000
LMV3	ISRO	Limited Launches Planned	10,000
Alpha	Firefly Aerospace	Medium Launch Capacity, Will become available in 2024	1,000
Electron	Rocket Labs	Option for small sat launch, limited payload capacity	300
<u>Not Available</u>			
Arianespace/Roscosmos's Soyuz 2	Arianespace	Available/Usage Retricted due to Russia sanctions	7,020
Glenn	Blue Origin	Available launch capacity purchased by Amazon	45,000
<u>Future Launch Vehicles</u>			
Starship	SpaceX	Launch Tests going through Q3 2023	136,000
Ariane 6	Arianespace	Launch by Q2 2024	10,350
Vulcan	ULA	Launch by Q1 2024	27,200

Source: Multiple Public Sources and Summit Ridge Group, LLC Analysis.

Using information about available satellite launch vehicles and their launch capacity to LEO (see Figure 3), Summit Ridge Group estimates that total launch capacity would be approximately 9,000,000 Kg or 9 Metric Kilotons²⁸ in the short-term (2023-2027) and could exceed more than 15,000,000 Kg or 15 Metric Kilotons²⁹ in the long term (2023 to 2030). When calculating launch capacity, we have assumed that the SpaceX Falcon 9 and the SpaceX Falcon Heavy would be the major launch vehicles between 2023 and 2030. Further complicating the issue is that SpaceX's Starlink is a competitor to many aspiring LEO broadband companies facing strict BIU deadlines.

ULA's Atlas V and Arianespace's Ariane 5 will be retired by the end of 2025. Amazon has purchased the limited remaining Atlas V and Ariane 5 launch capacity for Amazon's Project

²⁸ 1 Metric Kiloton = 1,000 Metric tons= 1,000,000 Kilograms

²⁹ To calculate the total launch capacity, SRG multiplied the launch capacity to the LEO of each launch vehicle (shown in Figure 3) times an estimated number of flights each year. Based on these assumptions, we expect a total launch capacity of approximately 9 Metric Kilotons between 2023 to 2027 and 15 Metric Kilotons between 2023 to 2030. This expected total launch capacity obviously depends on the actual number of launches.

Kuiper.³⁰ We, therefore, did not include ULA's Atlas V and Arianespace Ariane 5 in our launch capacity calculations.

Next-generation launch vehicles by ULA and Arianespace are inactive as of 2023. Moreover, their future availability is uncertain. Recent updates reveal that ULA's next-generation Vulcan³¹ and Arianespace's next-generation Ariane 6 have shifted their launch timelines to 2024.³²

Of other launch vehicle options, ISRO's LVM3 rocket is a viable non-US launch vehicle, but it has too few planned launches to affect demand. Rocket Labs' Electron and FireFly's Alpha launch vehicles have insufficient capacity to meaningfully participate in the deployment of the proposed multiple-satellite constellations (especially those with satellites numbering in the hundreds or thousands).

Based on these estimates, we believe there would be a shortage of approximately 4,000,000 Kg (4 Metric Kilotons) in short-term launch capacity and a long-term shortage of 10,000,000-11,000,000 Kg (10 to 11 Metric Kilotons).³³ This limited availability of launch capacity could adversely impact satellite operators if their spectrum licenses are canceled for failing to meet FCC deployment deadlines.

- **No Dramatic Increase in Launch Capacity Coming Soon**

The increased number of approved satellites has caused a surge in demand for launch vehicles. Startups offering launch services, such as Astra, Blue Origin, FireFly, Relativity, Rocket Labs, and Virgin Orbit, have recently emerged. Many have gone bankrupt or shuttered.³⁴ Most of the remaining startups have limited payload capacity (some have a payload capacity of less than 1,000 Kg; Blue Origin is an exception), and launching an entire satellite constellation of over a hundred satellites using a small launch vehicle with low payload capacity is nearly impossible. Instead, some startups are better suited to launch individual mini-satellites and cube satellites. Moreover, with the exception of SpaceX, the new launch entrants have experienced significant delays in route to achieving a regular launch cadence.

Providers like ULA and Arianespace expect to roll out their next-gen launch vehicles by the end of 2024, and it will likely take a few years until they achieve a regular, reliable launch

³⁰ Space Launch: Are We Heading for Oversupply or a Shortfall, McKinsey & Company, April 17, 2023, accessed August 14, 2023, <https://www.mckinsey.com/industries/aerospace-and-defense/our-insights/space-launch-are-we-heading-for-oversupply-or-a-shortfall/>.

³¹ Audrey Decker, "ULA's First Vulcan Launch Pushed to End of the Year," Defense One, July 13, 2023, accessed August 14, 2023, <https://www.defenseone.com/technology/2023/07/ulas-first-vulcan-launch-pushed-end-year/388503/>.

³² Elizabeth Howell, "When Will Ariane 6 Fly? Europe's New Heavy-Lift Rocket Battles Delays as Ariane 5 Era Ends," Space.Com, July 6, 2023, accessed August 14, 2023, <https://www.space.com/ariane-6-new-european-rocket-delays>.

³³ To calculate the total launch demand, SRG multiplied the mass of each LEO satellite times the estimated number of satellites planned to be launched (shown in Figure 2). Based on these assumptions, we expect a total launch demand of approximately 15 Metric Kilotons between 2023 and 2027 and 26 Metric Kilotons between 2023 and 2030. These estimates of launch demand would depend on the number of satellites launched.

³⁴ For example, Vector Launch and Virgin Orbit.

cadence. Both ULA and Ariane's new vehicles are expendable, sharply limiting the number of launches they can do compared to a reusable vehicle.³⁵

Despite no indications of short-term improvement in launch capacity, the ITU and the FCC continue to approve proposals from satellite operators for LEO-based satellite services. The shortage of launch capacity and lengthy wait times for satellite launches could lead to backlogs that may be problematic regarding FCC BIU dates.

- **Unrealistic BIU Deadlines May Cause Significant Harm**

The disconnect between BIU deadlines and available launch capacity may cause significant damage. Companies facing tight deadlines will try to pressure launch companies to launch as fast as possible and potentially short-change safety or environmental standards. Companies with promising technology but that are faced with losing their authorizations may fail, and society will be deprived of benefits from the technology.

Of course, not all of the approved satellites will be funded. Policymakers may believe there is no problem authorizing more satellites than can be launched because many won't get funded anyway. However, this argument is somewhat of a self-fulfilling prophecy. Many companies with pending BIU dates face significant funding challenges. However, funding challenges are heightened if the companies can't credibly explain to investors how they will secure sufficient launch capacity.

Policymakers may have begun to recognize the problem. The ITU, in a rare move, extended the BIU date for Rivada Space Networks.³⁶ It's not yet clear if the ITU's Rivada extension is an outlier event or the start of a trend. The industry and its investors need the latter.

In addition to extending BIU dates to give satellite authorization holders additional time for launch capacity to become available, the following developments are possible and may help, but they are far from certain:

- Satellite launch providers invest significantly in quicker processing for developing their launch vehicles and ramping up the launch capacity.
- SpaceX's Falcon 9/Falcon Heavy will achieve 100+ annual flights in upcoming years.
- SpaceX's Starship becomes available and quickly increases its launch capacity.

If policymakers don't act, the potential long-run damage from the satellite authorization/launch capacity mismatch is significant. In addition to safety and environmental risks, investors may become more reticent to invest in the industry with such high regulatory risk. This risk is unnecessary.

³⁵ Ariane 6 will have up to 11 launches per year (see: https://en.wikipedia.org/wiki/Ariane_6). By contrast, SpaceX's Falcon 9 launched 67 times in 2023 as of October 5th (See: Seth Kurkowski, *How Many Rockets has SpaceX Launched so Far in 2023?*, Space Explored (October 5, 2023). <https://spaceexplored.com/2023/10/05/spacex-launches-2023/>)

³⁶ ITU Radio Regulations Board Approves Waiver for Rivada LEO Constellation, Rivada Space Networks Press Release (July 5, 2023).