
Starlink Internet Services Limited: applications for six non-geostationary orbit earth station (gateway) licences

Request for comments

CONSULTATION:

Publication date: 21 June 2022

Closing date for responses: 19 July 2022

Contents

Section

1. Introduction	1
2. Assessment of application	3
3. Next steps	10

Annex

A1. Responding to this consultation	11
A2. Ofcom's consultation principles	14
A3. Consultation coversheet	15
A4. Consultation questions	16

1. Introduction

- 1.1 Non-geostationary orbiting (NGSO) satellite systems are a new way of delivering broadband services from space using a constellation of satellites in a low or medium orbit. These satellite services have the potential to deliver higher speeds and lower latency services.
- 1.2 As set out in our statement on [non-geostationary satellite systems](#), we have a new process for considering applications for the following types of spectrum licence:
- **Satellite (Earth Station Network):** this authorises an unlimited number of user terminals to connect to the NGSO system (subject to certain conditions). It also places certain conditions on the licence holder (typically a satellite operator) to coordinate with other licence-holders. We will refer to these in the rest of the document as “ESN licences”.
 - **Satellite (Non-Geostationary Earth Station):** this authorises gateway earth stations, which connect the NGSO system to the internet or to a private network. We will refer to these in the rest of the document as “NGSO gateway licences”.
- 1.3 On 27 May 2022, Ofcom received six applications from Starlink Internet Services Limited, a subsidiary of SpaceX (hereon referred to as SpaceX) for Non-geostationary Earth Station (Gateway) licences operating in the Ka band frequencies [27.5 – 27.8185 GHz, 28.4545 – 28.8265 GHz and 29.4625 – 30 GHz]. These will connect to SpaceX’s Starlink NGSO constellation. Details of the applications can be found under the “Applications received” in the [NGSO](#) section of our website. We will assess these six applications together (we refer to the six applications, as ‘the application’).
- 1.4 SpaceX has applied to use Ka-band uplink frequencies that fall within the parts of spectrum available under an NGSO gateway licence. In addition, they have also applied to use some wide bandwidth emissions (e.g. 480 MHz), parts of which may overlap into spectrum used by Spectrum Access 28 GHz licensees. Such use is possible providing SpaceX has made the necessary commercial agreements with the relevant Spectrum Access 28 GHz licensees to use that spectrum.
- 1.5 SpaceX provides satellite broadband services direct to consumers in the UK. It currently operates three non-geostationary gateways in the UK. Some of the licences for these gateways are held by third parties but operated by SpaceX via commercial arrangements. The licences for the NGSO gateways operated by SpaceX are held by:
- a) Arqiva Ltd;
 - b) Goonhilly Earth Station Limited; and
 - c) Starlink Internet Services UK Limited.

Details of these licences can be found on the [NGSO](#) section of our website.

Request for comments: Starlink NGSO gateway application

- 1.6 At the time of writing, there are three satellite operators holding ESN licences. These permit the licence-holder to operate in both the Ku band [14.0-14.25 GHz] and Ka band [27.5 – 27.8185 GHz, 28.4545 – 28.8265 GHz and 29.4625 – 30 GHz]. These operators are:
- a) Kepler;
 - b) Network Access Associates Ltd (OneWeb); and
 - c) Starlink Ltd
- 1.7 None of these operators is currently deploying terminals in the Ka band. Details of these licences can also be found on the [NGSO](#) section of our website.
- 1.8 When considering applications for these licences, amongst other considerations, we will take account their impact on technical coexistence and competition. As this is the first NGSO application under the new process, and the case appears to be reasonably straightforward, we have also published our preliminary views.
- 1.9 We are publishing this document to invite comments on the application and on our preliminary views. We will take into account all comments received and we are open to changing those views depending on responses and evidence submitted to us as part of this process.
- 1.10 Further information which explains the context and reason for this process and how to respond to licence applications can be found in our earlier statement on [non-geostationary satellite earth stations licence guidance](#).
- 1.11 The deadline for comments is Tuesday 19 July 2022.

2. Assessment of application

- 2.1 In this section we consider the coexistence and competition aspects of the applications. We outline relevant parts of the application and indicate where we would value input from stakeholders. We would encourage stakeholders to read the full application for each gateway.

Description of system

- 2.2 As context, SpaceX has provided a description of their system and a rationale for why they require the additional gateways they are applying for:

“Starlink was developed to bring high-speed, low-latency internet service to rural and remote areas.... In order to create a fully redundant and reliable system, Starlink needs multiple gateway sites to ensure that our satellites can always establish a reliable connection with a gateway. Moreover, because our satellites use a low orbit to achieve improved space sustainability and better network performance, SpaceX’s constellation requires sufficient gateway sites on the ground to ensure connection.”

Coexistence

- 2.3 When issuing new licences, one of Ofcom’s objectives is that all authorised systems are capable of coexisting (in bands they are using in common), such that they are all able to provide services to their users without experiencing harmful interference.
- 2.4 When applying for a licence, we ask applicants to demonstrate:
- a) Coexistence with other NGSO systems: applicants should demonstrate how coexistence is possible between their networks and both:
 - i) existing NGSO systems that are already licensed in the UK; and
 - ii) NGSO systems that have applied for a licence and whose application has been published for comment.
 - b) Ability to coexist with future NGSO systems: Applicants should state what flexibility their system has to achieve coexistence with future networks. This could include the measures they would be able to put in place if another network comes along in the future; it could also suggest measures future networks could reasonably be expected to put in place in order to coexist.

Coexistence with existing operators

- 2.5 In their applications, SpaceX state:
- a) their system can coexist in close proximity to other non-geostationary satellite gateways by leveraging several important design and operational techniques; and

“SpaceX’s coordination discussions are ongoing and affirm the benefits of the responsible spectrum sharing techniques described above. SpaceX is committed to its ongoing, good faith coordination with the two existing NGSO network earth station licenses, Network Access Associates Ltd and Kepler Communications Inc. Based on our understanding, neither of those systems will operate user terminals in the Ka band, so our discussions for this spectrum have centered around gateway earth stations”.

2.6 SpaceX has not mentioned coexistence with existing applicants. This is not surprising as theirs is the first application through our new process.

2.7 Our preliminary view is that SpaceX will be able to coexist with *existing* NGSO licence holders because none of the other operators use the frequencies that the application relates to. That is:

- a) There are no other NGSO gateway licences in the Ka band which would overlap with the frequencies applied for by SpaceX.
- b) None of the ESN holders currently operate terminals which use the Ka band.

Question 1: Do you anticipate one or more of the NGSO gateways in these applications will pose coexistence challenges to existing services?

Please provide evidence of the impact of any likely interference in terms of throughput and unavailability.

Coexistence with future systems

2.8 As outlined in our Statement on Updates to NGSO Licensing, we want to enable as many NGSO systems as possible, to provide services and increase choice for people and businesses in the UK. We therefore anticipate additional applications for NGSO gateways in the future to support other NGSO systems in the UK.

2.9 Although we do not expect licensees to foresee the characteristics or the number of future systems that will apply for a licence in the UK, we request that applicants:

- a) explain how their existing network design and operating model might facilitate coexistence with other NGSO satellite systems and any limitations to their systems; and
- b) outline any additional measures which would allow improved coexistence with other systems.

2.10 We also request applicants to be aware that they may be expected to take reasonable measures to accommodate such future systems (in order to avoid material degradation to either service).

2.11 SpaceX states in their application that:

“the private coordination between two companies is the preferred means of achieving coexistence. Where coordination agreements cannot be reached, the Starlink system is able to operate on parts of the spectrum bands during inline events”.

2.12 SpaceX’s view is that they can coexist with other NGSO gateways in close proximity using a number of design and operational techniques (these are detailed in the application). They expect other systems to employ similar spectrum management techniques to ensure equal responsibility and burden for managing interference. They believe one system should not suffer because another is designed or operated inflexibly.

2.13 SpaceX states that it:

“does not require any specific geographic separation between its gateway earth stations and those of other co-frequency systems but will undertake coordination assessments based on the proposed locations and operating parameters of each system”.

2.14 We are interested in obtaining comments on SpaceX’s proposed coexistence plans. Our initial view is that it provides sufficient comfort that the Starlink systems will be capable of coexisting with new and future NGSO gateway and terminal operators.

Question 2: Do you consider that the measures to enable coexistence with future systems (gateways and terminals), as set out by the applicant, are reasonable? If not, what are your concerns and to which specific gateway sites do your concerns relate?

Competition

2.15 As outlined in in the Annex A3 of our statement on updates to NGSO licensing, our starting position with any competition check is to authorise applications, where possible. We have outlined that we take into account four factors:

- a) the extent of the likely risks to competition;
- b) the potential benefits from granting NGSO licence applications;
- c) ensuring that time and resources devoted to the licensing process are proportionate to the risks and benefits; and
- d) that NGSO services are currently in their infancy.

Risks to competition

2.16 As outlined in the NGSO licensing statement, there are four potential risks associated with applications for gateway licences. We have outlined four types of risks that the application may raise.

An NGSO operator operates from all or most of the available gateway sites, potentially creating a monopoly outcome and blocking future entrants from accessing the market

2.17 The following facts are relevant to our assessment:

- a) There are thirteen existing teleport¹ sites in the UK: Aberdeen, Brechin, Brookmans Park, Chalfont Grove, Cobbett Hill, Goonhilly, Isle of Man, Lawford Heath, Maddley, Martlesham Heath, Morn Hill, Salford and Whitehill (see Figure 1 below).
- b) SpaceX is the only company currently operating NGSO gateways in the UK. It operates three gateways at existing teleports. They are in Goonhilly, Isle of Man, and Chalfont.
- c) The application relates to six additional gateway sites at Bedford, Bristol, Fawley, Hoo, Morn Hill, Wherstead and Woodwalton.
- d) If successful, this application will bring the total number of SpaceX gateways operating in the UK to nine (its three existing gateways plus the six licences requested in the application).

Figure 1: Map of existing teleport sites (grey dishes), current SpaceX gateways (red) and proposed SpaceX gateways (green)



¹ A teleport is a site operating (several) gateways from multiple operators. For Geostationary Orbiting satellites, it is easier to locate gateways at the same site as other operators.

2.18 Apart from the proposed gateway at Morn Hill, SpaceX is planning to develop new sites rather than choosing to locate their gateways at existing teleports. Up to nine existing teleports therefore remain available for development by potential entrants (in addition to the possibility of other operators developing their own sites).

An NGSO operator takes preferential sites, raising the cost of entry to subsequent entrants

2.19 There are three main reasons why a site may be preferential for an NGSO gateway: access to suitable infrastructure (e.g. existing control facilities, high quality fibre links, suitable power generation), access to spectrum, and proximity to customer base.

2.20 **Access to suitable infrastructure:** As discussed in the previous section, there will remain a number of existing gateway sites available to future operators to potentially use. In addition, not all NGSO constellations will require gateways in the UK. This is dependent on the design of the global network. For some, it may be possible or even preferential to provide services to UK customers by using gateways outside of the UK.

2.21 **Access to spectrum:** Most NGSO operators wishing to use Ka band for gateway Earth Stations require access to 27.5-30 GHz. In 2006, we auctioned a number of these frequencies to four licence-holders: [Arqiva, Vodafone, Telefonica and UK Broadband \(now Three\)](#). The link shows the frequencies held by these licence-holders and regions of the UK where they apply. As indicated in the link above, UK Broadband traded spectrum to Arqiva in [six locations](#).

2.22 As a consequence, the following frequencies are available in our NGSO gateway licences: 27.5 – 27.8185 GHz, 28.4545 – 28.8265 GHz and 29.4625 – 30 GHz. NGSO operators may also access the auctioned spectrum by entering into commercial arrangements with the relevant licence holders in the area where they wish to establish a gateway.

2.23 The only exceptions to this are the Isle of Man and Channel Islands, which did not take part in the 28 GHz spectrum auction. Here the full 27.5-30 GHz spectrum is available under an Ofcom NGSO Gateway licence.

2.24 In terms of SpaceX's application:

a) SpaceX have confirmed that they have the necessary commercial arrangements with 28GHz Licence Holders in the locations they are seeking to operate.

b) SpaceX already operate at Chalfont and is proposing to operate at one of the six sites where Arqiva have traded spectrum with UK Broadband (Morn Hill and Bedford Teleport).

c) SpaceX operates a gateway site on the Isle of Man.

2.25 Our preliminary assessment view is that there will remain options for potential entrants to access spectrum at relevant sites.

2.26 **Proximity to customer base.** Depending on network architecture, operators may need to place gateways closer to their customer base. Given the range of different markets that

NGSO services are likely to serve and the availability of other potential gateway sites, our preliminary view is that this application will not prevent future NGSO operators from siting their gateways near UK customers, if required.

An NGSO operator may require large separation distances between its gateway(s) and that of others, thereby blocking potential sites to future entrants

2.27 SpaceX's view is that it does not need geographic separation between its gateways and those of other operators.

2.28 Our preliminary view is that SpaceX would not be blocking potential gateway sites for others.

An NGSO operator applies for gateway licences at sites which it does not plan to develop in order to deliberately block future entrants

2.29 Ofcom has mitigated this risk, in part, by requiring all licence holders to commence transmissions within 12 months of receiving a licence.

2.30 SpaceX advises Ofcom that it has a backlog of customers waiting to connect to its service. SpaceX advised Ofcom that it has informed potential customers in six UK cities that it cannot serve them at this time. This tends to indicate that SpaceX will have an incentive to develop the relevant sites to serve customers.

2.31 In summary, our preliminary assessment is that few competition risks associated with this application:

- a) Future entrants will be able to access infrastructure in the UK, including preferential sites or could choose to serve UK customers from gateways outside the UK.
- b) We do not believe that granting the licences will prevent or restrict entry.

Benefits

2.32 In our [Connected Nations 2021](#) report, we stated that:

“Satellite remains an option for a fixed broadband connection, particularly for premises without the alternative of a fixed provider. However, the number of customers accessing satellite services remains low in comparison with traditional broadband provision”².

2.33 SpaceX state in their application that the additional gateway sites will help to meet user demand and provide the weather diversity and network resiliency needed to provide high-speed, low-latency Starlink service to consumers in the UK.

2.34 SpaceX refer to a [study by OOKLA](#), which they commissioned earlier this year, comparing their service to other satellite services and terrestrial broadband in fifteen countries. They claim Starlink deploys a broadband service with speeds of over 100Mbps and latency of 20-

² See p. 20.

40ms. They state this can be faster than the median speeds from terrestrial broadband services and other satellite broadband services.

- 2.35 Our preliminary assessment is that granting these licences would increase the availability of high-quality broadband services, which would be beneficial for UK consumers.

Question 3: Could the granting of one or more of these licences prevent your service from operating in the UK or make it less attractive or more costly to enter the market? If yes:

- Please outline your proposed services, including gateway locations, and indicate when you are planning to start deploying your services.
- Please also explain the reasons why granting these licence applications would affect or restrict (i.e. make more costly or less attractive) your future service in the UK.
- Please state which of the proposed gateway applications would affect your deployment (if relevant).

Other concerns

- 2.36 Coexistence and competition are the two issues on which we expect to make our licensing decisions (as set out in the NGSO Licensing updates Statement).

Question 4: Do you have any additional concerns or comments regarding this application?

Proposal to grant authorisations

- 2.37 Taking the evidence presented by SpaceX and our assessment of the risks and benefits of granting this application, we propose to grant SpaceX all six applications for gateway licences.

3. Next steps

- 3.1 The applications are available on [our website](#), under “Applications received for NGSO Earth Station (Gateway) licences”. We welcome comments on these applications. Responses should be submitted electronically to ngso.licensing@ofcom.org.uk by Tuesday 19 July 2022.
- 3.2 Following this, we will review responses and make our assessment. Our decision will be published on our website. If any authorisations for NGSO Earth Station (Gateways) have been granted, we will also publish these on the website in due course.
- 3.3 Given the number of gateway applications received, we anticipate it could take the full 40 working days to make our assessment. We expect to publish a decision by Thursday 15 September 2022.

A1. Responding to this consultation

How to respond

- A1.1 This commenting period will be open for 20 working days. Ofcom would like to receive views and comments on the issues raised in this document, by 5pm on **Tuesday 19 July 2022**.
- A1.2 You can download a response form from <https://www.ofcom.org.uk/consultations-and-statements/category-3/starlink-gateway-licence-applications>. You can return this by email or post to the address provided in the response form.
- A1.3 If your response is a large file, or has supporting charts, tables or other data, please email it to ngso.licensing@ofcom.org.uk, as an attachment in Microsoft Word format, together with the [cover sheet](#). In order to process these applications in a timely manner, we will not accept any applications after 30 July 2022.
- A1.4 In order to ensure we can receive, review and assess all comments in a timely manner, we will not be receiving applications via post.
- A1.5 We welcome responses in formats other than print, for example an audio recording or a British Sign Language video. To respond in BSL:
- Send us a recording of you signing your response. This should be no longer than 5 minutes. Suitable file formats are DVDs, wmv or QuickTime files. Or
 - Upload a video of you signing your response directly to YouTube (or another hosting site) and send us the link.
- A1.6 We will publish a transcript of any audio or video responses we receive (unless your response is confidential)
- A1.7 We do not need a paper copy of your response as well as an electronic version. We will acknowledge receipt if your response is submitted via the online web form, but not otherwise.
- A1.8 You do not have to answer all the questions in the consultation if you do not have a view; a short response on just one point is fine. We also welcome joint responses.
- A1.9 It would be helpful if your response could include direct answers to the questions asked in the consultation document. The questions are listed at Annex A4. It would also help if you could explain why you hold your views, and what you think the effect of Ofcom's proposals would be.
- A1.10 If you wish to respond specifically to any of the individual gateway licence applications, please quote the specific application reference on our [website](#).
- A1.11 If you want to discuss the issues and questions raised in this consultation, please contact Elizabeth Quintana by email to ngso.licensing@ofcom.org.uk.

Confidentiality

- A1.12 Consultations are more effective if we publish the responses before the consultation period closes. In particular, this can help people and organisations with limited resources or familiarity with the issues to respond in a more informed way. So, in the interests of transparency and good regulatory practice, and because we believe it is important that everyone who is interested in an issue can see other respondents' views, we usually publish all responses on [the Ofcom website](#) as soon as we receive them.
- A1.13 If you think your response should be kept confidential, please specify which part(s) this applies to and explain why. Please send any confidential sections as a separate annex. If you want your name, address, other contact details or job title to remain confidential, please provide them only in the cover sheet, so that we don't have to edit your response.
- A1.14 If someone asks us to keep part or all of a response confidential, we will treat this request seriously and try to respect it. But sometimes we will need to publish all responses, including those that are marked as confidential, in order to meet legal obligations.
- A1.15 Please also note that copyright and all other intellectual property in responses will be assumed to be licensed to Ofcom to use. Ofcom's intellectual property rights are explained further in our [Terms of Use](#).

Next steps

- A1.16 Following this commenting period, Ofcom will publish its decision on 15 September 2022.
- A1.17 If you wish, you can [register to receive mail updates](#) alerting you to new Ofcom publications.

Ofcom's consultation processes

- A1.18 Ofcom aims to make responding to a consultation as easy as possible. For more information, please see our consultation principles in Annex A2.
- A1.19 If you have any comments or suggestions on how we manage our consultations, please email us at consult@ofcom.org.uk. We particularly welcome ideas on how Ofcom could more effectively seek the views of groups or individuals, such as small businesses and residential consumers, who are less likely to give their opinions through a formal consultation.
- A1.20 If you would like to discuss these issues, or Ofcom's consultation processes more generally, please contact the corporation secretary:

Corporation Secretary
Ofcom
Riverside House
2a Southwark Bridge Road
London SE1 9HA
Email: corporationsecretary@ofcom.org.uk

A2. Ofcom's consultation principles

Ofcom has seven principles that it follows for every public written consultation:

Before the consultation

- A2.1 Wherever possible, we will hold informal talks with people and organisations before announcing a big consultation, to find out whether we are thinking along the right lines. If we do not have enough time to do this, we will hold an open meeting to explain our proposals, shortly after announcing the consultation.

During the consultation

- A2.2 We will be clear about whom we are consulting, why, on what questions and for how long.
- A2.3 We will make the consultation document as short and simple as possible, with a summary of no more than two pages. We will try to make it as easy as possible for people to give us a written response. If the consultation is complicated, we may provide a short Plain English / Cymraeg Clir guide, to help smaller organisations or individuals who would not otherwise be able to spare the time to share their views.
- A2.4 We will consult for up to ten weeks, depending on the potential impact of our proposals.
- A2.5 A person within Ofcom will be in charge of making sure we follow our own guidelines and aim to reach the largest possible number of people and organisations who may be interested in the outcome of our decisions. Ofcom's Consultation Champion is the main person to contact if you have views on the way we run our consultations.
- A2.6 If we are not able to follow any of these seven principles, we will explain why.

After the consultation

- A2.7 We think it is important that everyone who is interested in an issue can see other people's views, so we usually publish all the responses on our website as soon as we receive them. After the consultation we will make our decisions and publish a statement explaining what we are going to do, and why, showing how respondents' views helped to shape these decisions.

A3. Consultation coversheet

BASIC DETAILS

Consultation title:

To (Ofcom contact):

Name of respondent:

Representing (self or organisation/s):

Address (if not received by email):

CONFIDENTIALITY

Please tick below what part of your response you consider is confidential, giving your reasons why

Nothing

Name/contact details/job title

Whole response

Organisation

Part of the response

If there is no separate annex, which parts? _____

If you want part of your response, your name or your organisation not to be published, can Ofcom still publish a reference to the contents of your response (including, for any confidential parts, a general summary that does not disclose the specific information or enable you to be identified)?

DECLARATION

I confirm that the correspondence supplied with this cover sheet is a formal consultation response that Ofcom can publish. However, in supplying this response, I understand that Ofcom may need to publish all responses, including those which are marked as confidential, in order to meet legal obligations. If I have sent my response by email, Ofcom can disregard any standard e-mail text about not disclosing email contents and attachments.

Ofcom seeks to publish responses on receipt. If your response is non-confidential (in whole or in part), and you would prefer us to publish your response only once the consultation has ended, please tick here.

Name

Signed (if hard copy)

A4. Consultation questions

A4.1 We are seeking comments from stakeholders on the application from SpaceX for 6 NGSO Earth Station (gateway) licences in relation to the following questions:

Question 1: Do you anticipate one or more of the NGSO gateways in these applications will pose coexistence challenges to existing services?

Please provide evidence of the impact of any likely interference in terms of throughput and unavailability.

Question 2: Do you consider that the measures to enable coexistence with future systems, as set out by the applicant, are reasonable? If not, what are your concerns and to which specific gateway sites do your concerns relate?

Question 3: Could the granting of one or more of these licences prevent your service from operating in the UK or make it less attractive or more costly to enter the market? If yes:

- Please outline your proposed services, including gateway locations, and indicate when you are planning to start deploying your services.
- Please also explain the reasons why granting these licence applications would affect or restrict (i.e. make more costly or less attractive) your future service in the UK.
- Please state which of the proposed gateway applications would affect your deployment (if relevant).

Question 4: Do you have any additional concerns or comments regarding this application?