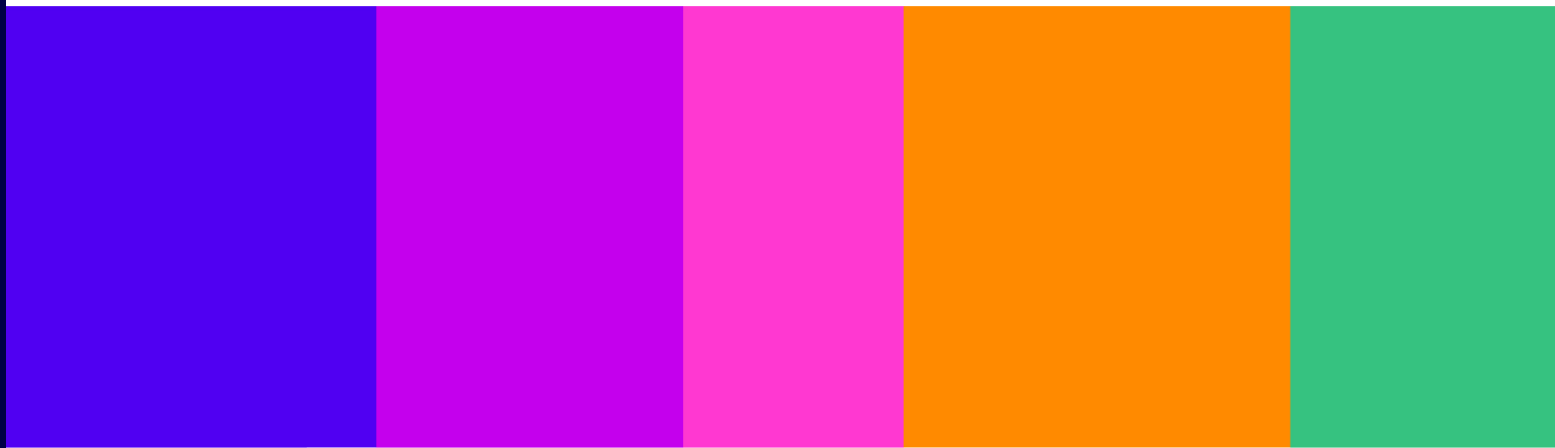


Starlink's request to vary four non-geostationary gateway licences

Decision

Statement

Published 1 August 2024



Contents

Section

1. Overview.....	3
2. Introduction and background.....	4
3. Assessing the impact on NGSO coexistence	7
4. Assessing the impact on competition	13
5. Other consultation questions.....	18
6. Our decision.....	22

Annex

A1. Impact assessments	23
------------------------------	----

1. Overview

- 1.1 This document sets out our decision on a request from Starlink Internet Services Limited (referred to in this document as ‘Starlink’) to vary four of its UK wireless telegraphy satellite geostationary earth station licences (the NGSO gateway licences). These licences authorise Starlink to operate gateway earth stations in the Ka band in the UK, to connect to its existing NGSO satellite system, which it also refers to as ‘Starlink’. It is proposing to upgrade four of its gateway sites by expanding the number of antennas operating at each site in order to meet growing demand for its broadband service.
- 1.2 NGSO systems are a way of delivering broadband services from space using a constellation of satellites, usually in a low or medium orbit. They have the potential to deliver high speed and low latency services to consumers and businesses. Gateway earth stations connect these NGSO systems to the internet or private networks.
- 1.3 Our initial assessment of [Starlink’s request to vary](#) its NGSO gateway licences is set out in our April 2024 consultation (the Starlink consultation). In that document, we proposed to approve the variations to all four of Starlink’s NGSO gateway licences. We have now assessed stakeholders’ responses regarding the ability of Starlink’s upgraded gateway earth stations to coexist with other current and future NGSO licensees and considered the competition issues raised by stakeholders in their submissions.

What we have decided – in brief

We have decided to approve Starlink’s request to vary four of its NGSO earth station gateway licences for sites at Fawley, Wherstead, Woodwalton and the Isle of Man.

This decision (taking account, where relevant, of the two surrendered NGSO gateway licences in October 2023), will enable Starlink to provide additional satellite connectivity services to a greater number of households, businesses, and government customers in the UK using Ka band frequencies 27.5-28.0525 GHz, 28.4445-29.0605 GHz, and 29.4525-30GHz.

On coexistence, we consider that Starlink’s expanded NGSO gateways will have the technical capabilities to coexist with both existing (and future) NGSO licensees operating in the Ka band in the UK, and are assured that its NGSO system is designed with sufficient flexibility to mitigate harmful interference should it arise. We are also satisfied that Starlink has provided suitable evidence of coordination discussions with other NGSO licensees and that it intends to continue its efforts to cooperate with other licensees, ahead of the upgrades to its NGSO gateway sites which we understand it wishes to implement following this decision.

In addition, we assess that there is a low risk of an adverse effect on competition from approving the variation to the NGSO gateway licences, and that the upgraded NGSO gateways sites would benefit UK citizens and consumers.

We will now proceed to vary Starlink’s four NGSO gateway licences – for the Fawley, Wherstead, Woodwalton and Isle of Man sites. A copy of the four varied licences will be available under the “Existing licences” section of our [NGSO licensing webpage](#).

The overview section in this document is a simplified high-level summary only. Our decision and reasoning are set out in the full document.

2. Introduction and background

- 2.1 Our NGSO licensing process for considering applications for NGSO spectrum licences (and requests to vary NGSO licences) aims to enable citizen and consumer benefits such as improved connectivity. It was designed to encourage greater cooperation between NGSO licensees, enhance our ability to intervene if harmful interference arises, safeguard competition and ensure greater transparency through a consultation process. Our approach to NGSO licensing is set out in our [Non-geostationary satellite systems Licensing updates](#) (the 2021 NGSO statement) and [guidance for NGSO applicants on the licensing process](#).
- 2.2 Our NGSO licensing process covers two types of NGSO licences:
- *Satellite (earth station network) licence* – for NGSO use: authorises an unlimited number of user terminals, for example a satellite dish, to connect to the NGSO satellite system ('the NGSO network licence').
 - *Satellite (non-geostationary earth station) licence*: authorises gateway earth stations connecting the NGSO satellite system to other services ('the NGSO gateway licence').
- 2.3 This decision document relates to a request to vary the second of these licence types: the **NGSO gateway licence**.
- 2.4 The NGSO gateway licence covers UK earth station hubs connecting an NGSO satellite system to the internet and/or private networks and cloud services. We require the holder of the NGSO gateway licence to have control over the gateway earth station (so it is typically held by a satellite or teleport operator), and to only operate gateways in connection with a licenced NGSO system under an NGSO network licence. The NGSO gateway licence also places other conditions on licensees, including that gateways must become operational within 12 months of the licence being granted, and managing the operation of the gateway to prevent harmful interference (see condition 5 "Additional conditions"). All NGSO licences are listed in the "Existing licences" section of our [NGSO licensing webpage](#).
- 2.5 As set out in our [NGSO licensing guidance](#), we review requests to vary NGSO licences on a case by case basis. Where the proposed modification could materially impact the interference environment for other NGSO operators, we may request that the licensee submit a full NGSO licence application.

Starlink's NGSO licences and variation request

- 2.6 Starlink (a subsidiary of SpaceX) operates a low orbit NGSO constellation (also known as 'Starlink') which requires multiple gateway sites in the UK to ensure that its NGSO system can always establish a reliable connection with a gateway. Starlink has held an NGSO network licence since 2019 for its NGSO constellation in the Ka band in the UK, which is already operational in the UK.
- 2.7 In May 2022, Starlink Internet Services used our (then) new NGSO licencing process to submit [applications for six NGSO gateway licences](#) at Bristol, Fawley, Hoo St Werburgh, Morn Hill, Wherstead and Woodwalton, to connect to its first generation (Gen1) NGSO constellation. Our decision to grant the six NGSO gateway licences was set out in our [2022 Starlink NGSO gateway statement](#). Starlink subsequently surrendered two NGSO gateway

licences (for sites in Bristol and Hoo St Werburgh) in October 2023. All of Starlink's NGSO gateways operate using the Ka band in 27.5-28.0525 GHz, 28.4445-29.0605 GHz, and 29.4525-30GHz.¹

2.8 In March 2024, Starlink requested to vary four of its remaining five NGSO gateway licences in the UK (for sites at Fawley, Wherstead, Woodwalton and the Isle of Man²) to meet growing demand for its broadband services and so that it can reach a greater number of UK customers. Starlink is proposing to expand the number of antennas operating at each site to connect to both its Gen1 and Gen2 (second generation) NGSO constellations³, and therefore requests that we authorise additional capacity for:

- the Fawley, Wherstead and Woodwalton gateway sites – an additional 24 antennas at each, bringing the total number of antennas (and Ka beams directed) at each site to 32; and
- the Isle of Man gateway site – an additional 32 antennas, bringing the total number of antennas (and Ka beams directed) at this site to 40.

2.9 We considered Starlink's licence variation request and assessed that the proposed increase in antennas to serve Starlink's Gen2 constellation could potentially introduce a change to the interference environment. This is because such an increase could allow it to connect to more satellites simultaneously, increasing the number of directional Ka beams and potentially resulting in higher transmitted and received power levels at these gateway locations. We therefore requested that Starlink submit a new NGSO application so that we could assess any impact from its request to vary the NGSO gateway licences.

2.10 We refer to these four NGSO gateway licence variation requests collectively in this document as 'Starlink's licence variation request'. In assessing this request, where relevant in the Starlink consultation and this document, we have taken account of the surrendered gateway licences. We understand Starlink wishes to implement these upgrades to its NGSO gateways as soon as possible. Further information about Starlink's NGSO gateways can be found in [Starlink's NGSO gateway licence application](#) (reference: STRLNK-GAT-2).

Consultation and summary of responses

2.11 Taking account of the evidence presented by Starlink, we published the [Starlink consultation](#) on 26 April 2024 setting out our preliminary view that we were minded to approve its request to vary four of its NGSO gateway licences as described, and invited comments on Starlink's licence variation request and our views. We noted we were open to changing

¹ Additional NGSO gateway frequencies were added to NGSO gateway licences following our [28 GHz statement](#) in March 2024, and these are included in this range. Starlink's NGSO gateways are capable of operating in all frequencies in the range 27.5-30 GHz but the NGSO gateway licence does not authorise use of this full frequency range. Starlink may operate in these other frequencies subject to commercial agreements with the relevant 28GHz band licensee(s).

² Licence reference numbers for each gateway site are: Fawley (1293217), Wherstead (1293534), Woodwalton (1293303), and the Isle of Man (1249304). These gateway sites are currently authorised to operate up to 9 Ka band parabolic antennas.

³ The Federal Communications Commission in the United States has authorised 4408 satellites for the Gen1 constellation, and 7500 satellites for the Gen2 constellation.

those views depending on responses and evidence submitted to us as part of the consultation process. The Starlink consultation closed on 31 May 2024.

- 2.12 We received two responses to this consultation – one confidential, and another non-confidential response from Viasat – both of which were predominantly concerned with interference into GSO services. We have now published Viasat’s response alongside Starlink’s licence variation request and consultation on our [website](#). We have established through our routine industry engagement that other NGSO licensees and key stakeholders did not wish to raise particular issues over Starlink’s licence variation request.
- 2.13 We have carefully considered all relevant consultation responses in finalising our decision on Starlink’s licence variation request. This document summarises the main points made by stakeholders in their submissions and our assessment of those points, under headings prompted by the six questions we asked in the Starlink consultation. We have collated answers under the most appropriate heading; in some cases this means respondents’ comments are addressed under different headings to those they used.

Structure of this document

- 2.14 The rest of this document is structured as follows:
- Section 3 assesses respondents’ views on the capability of Starlink’s NGSO gateways to coexist with other (current and future) NGSO systems.
 - Section 4 assesses stakeholders’ responses on the potential competition risks and benefits arising from Starlink’s licence variation request.
 - Section 5 covers any other comments provided on the Starlink consultation, as well as responses regarding our equality and Welsh language impact assessments.
 - Section 6 summarises our decision and next steps.
 - Annex 1 sets out our impact assessments, including on equality and the Welsh language.

3. Assessing the impact on NGSO coexistence

- 3.1 Our [2022 Space Spectrum Strategy](#) sets out our aspiration to enable as many NGSO systems as possible, to provide services and increase choice for citizens and consumers in the UK. NGSO satellites are dynamic by nature, creating a complex spectrum management environment, both in space and on the ground. We recognise the importance of ensuring that different NGSO systems are able to operate alongside each other without increasing the risk of harmful interference, and this is one of the aims of our [NGSO licensing process](#).
- 3.2 The International Telecommunication Union (ITU) Radio Regulations mandate that NGSO satellite operators establish coordination agreements to prevent harmful interference. An order of precedence is assigned to satellite systems or networks based on its satellite filing submission date, and operators must seek an agreement with operators of earlier filed systems and networks. Ultimately, notifying administrations responsible for the satellite filing are responsible for ensuring that operators comply with these ITU obligations.

Coexistence with existing NGSO systems

- 3.3 As set out in paragraph 2.4, both an NGSO network licence and NGSO gateway licence are needed to govern the operation of an NGSO gateway earth station, and ensure it protects other spectrum users (see condition 5.2 of the NGSO gateway licence). Together, they impose conditions on the operation of the whole NGSO system, including an obligation to cooperate with other NGSO licensees and to take action to mitigate harmful interference.
- 3.4 When applying for an NGSO gateway licence, we ask applicants to demonstrate how coexistence is possible between their NGSO gateway and other NGSO systems or gateways already licensed in the UK (as well as any NGSO licence application consultations) that are operating in the same frequency bands. Applicants should also show how they are able to coexist with other specific co-frequency earth stations registered with the ITU⁴.
- 3.5 In the Starlink consultation, we noted the seven existing NGSO gateway earth stations (in table 3), which all connect to Starlink’s NGSO constellation, with each individually licensed to operate in the Ka band:
- five licences are held by Starlink (for Morn Hill, Fawley, Wherstead, Woodwalton, and the Isle of Man);
 - one licence is held by Arqiva Ltd (for Chalfont); and
 - one licence is held by Goonhilly Earth Station Limited (for Goonhilly).

⁴ These are listed at the bottom of our [NGSO licensing webpage](#).

- 3.6 In addition, there are now four NGSO network licensees (Rivada Space Networks GmbH, Mangata Edge Ltd, Telesat LEO Inc, and NSLComm Ltd), who plan to operate terminals using frequencies in the Ka band.⁵
- 3.7 As both an NGSO network and NGSO gateway licensee, Starlink will have control over the full NGSO system, including customers’ access to the satellite network from any user terminals or earth stations operating from the ground. This control includes the ability to act upon and eliminate any interferer transmission(s) at any time.
- 3.8 Starlink remains the only NGSO satellite operator to have NGSO gateways in the UK. Its licence variation request stated that it does not require a geographic separation between its gateways and the gateways of other commercial satellite operators, so it does not believe its existing sites will restrict the choice of location for future UK NGSO gateways.
- 3.9 We note there are a number of co-frequency earth stations registered with the ITU with which Starlink is also required to coexist. Additionally, in support of its licence variation request, Starlink has provided additional (confidential) information on its coordination agreements and ongoing discussions with existing NGSO licensees, given that its Gen2 constellation operates under a different satellite filing.
- 3.10 Our preliminary view in the Starlink consultation was that the increase in antennas at several sites, and the corresponding increase in the number of beams pointing at those sites is unlikely to have a negative impact on existing NGSO systems. Based on the information Starlink provided, we said that we expected it to have the technical capabilities to mitigate interference to other NGSO systems.
- 3.11 We asked stakeholders the following question:

Consultation question 1

Do you anticipate this licence variation will pose coexistence challenges to existing NGSO services?

Consultation responses

- 3.12 We received one non-confidential response from Viasat to question 1 on the coexistence challenges that might arise for NGSO systems.
- 3.13 **Implications of increased beam activity** - Viasat considers that Starlink’s licence variation request to increase the number of antennas at gateway sites will impact shared space resources, including for other NGSO operators:
- “... with more antennas being requested in the UK, the number of active Starlink satellites transmitting and receiving to and from the UK would increase. The use of 1.8 m antennas for the Starlink gateways would add further constraints on the sharing situation and availability of look angles.”
- 3.14 **Potential for increasing interference from scale of Starlink’s NGSO system** - Viasat also suggests that the overall size of Starlink’s constellation (introducing Gen2 satellites to the

⁵ Other existing NGSO network licensees (Starlink and Network Access Associates Ltd, a subsidiary of Eutelsat OneWeb) operate terminals using frequencies in the Ku band (new applicant Kepler Communications Inc. is also seeking an NGSO network licence in the Ku band).

existing Gen1 footprint) will have a precluding effect on shared space resources, and potentially increase interference into other NGSO systems:

“This licence variation represents a threat to NGSO spectrum sharing within the UK as (Starlink) gateway links have the potential to “blanket the sky,” causing many in-line interference events, limiting and sometimes completely blocking, other NGSO systems from sharing the same spectrum.”

- 3.15 **Request for new licence condition** - As a result, Viasat believes that a new NGSO licence condition for larger NGSO constellations is needed to address the risks of interference and/or precluding smaller operators to provide services (for example requiring larger operators to use look-angles⁶ or spectrum splitting).

Our assessment

- 3.16 Before turning to our assessment of stakeholder responses, we note that under our NGSO licensing process, a key consideration for us is confirming that NGSO gateway licensees are able to coexist with other NGSO licensees. As stated in paragraph 2.12, UK NGSO licensees and other key stakeholders did not raise any concerns regarding the size of Starlink’s NGSO system (including the increase in number of beams) or increased risks of harmful interference arising from Starlink’s licence variation request.
- 3.17 We also note the responsibility for ensuring that satellite operators comply with their ITU obligations, including managing coexistence between satellite filings, and shared use of space resources, ultimately rests with the notifying administration responsible for the NGSO system – see paragraphs 3.2 and 5.12 for an overview on the relevant elements of the ITU regulatory framework. We consider shared use of space resources in section 4 (from paragraph 4.21).
- 3.18 Inmarsat, which has merged with Viasat⁷, has recently submitted an application to operate an NGSO system in the UK under an NGSO network licence. While that application (and consultation) is yet to be published, Inmarsat (and accordingly its parent Viasat) submits in its application that it has achieved a coordination agreement with Starlink and should therefore be able to operate alongside Starlink without risks of interference. We have considered this wider context in our assessment of coexistence with other NGSO systems.

Implications of increased beam activity

- 3.19 We recognise that increasing the number of antennas (and corresponding beams) at four gateway sites has the potential to change the interference environment and/or increase the risk of harmful interference for satellite operators, potentially blocking other NGSO systems from using the same frequencies. This was a key reason for consulting on Starlink’s licence variation request, as explained in paragraph 2.9.
- 3.20 In Starlink’s licence variation request, it explains that it has invested in designing a system that is flexible and can coexist with other NGSO gateways in close proximity through a range of techniques including:

⁶ Viasat describes look angle splitting as “requiring NGSO systems serving a country in overlapping frequencies to divide the range of satellite azimuths as seen from a location on the Earth whenever the potential for NGSO/NGSO interference exists at that location”.

⁷ Inmarsat was acquired by Viasat in May 2023.

- directional antennas designed to maximise transmissions towards its NGSO system and minimise power directed elsewhere;
- multiple beams with very narrow transmit and receive beam widths;
- steerable beams on satellites;
- multiple satellites in view to provide options for gateway links; and
- the use of shielding fences and other physical obstructions ('ground clutter') that protect adjacent users from potential interference.

3.21 Taking account of this flexibility and these techniques, we continue to assess that Starlink's NGSO system has the technical capability to coexist with existing (and future) NGSO licensees operating Ka band terminals or gateways on the ground in the UK.

Potential for increasing interference from scale of Starlink's NGSO system

3.22 In its application Starlink also states it has a "demonstrated track record of working directly with NGSO operators to coordinate and coexist and will continue to do so with both current and future operators". We note that Starlink continues to progress its coordination agreements and are therefore assured that Starlink is taking reasonable measures to reduce its risk of harmful interference.

3.23 We also note that a larger constellation would not necessarily increase the risk of in-line events or block other NGSO systems; it could also mean a greater choice of satellites to connect to making coexistence more, rather than less likely. Further, the techniques listed above provide Starlink with a range of methods to achieve coexistence with other NGSO licensees providing a service in the UK.

Request for new licence condition

3.24 Our NGSO licences do not specify fallback conditions or particular solutions⁸ such as look angles or spectrum splitting, because any one solution could inadvertently favour or disadvantage particular NGSO operators. As set out in our 2021 NGSO statement, our preferred way to achieve efficient use of spectrum is through coordination agreements; these are bilateral agreements which allow operators to choose the optimum approach for coexistence taking into account a range of factors including the respective architectures of each NGSO system and other factors such as services, customers and target markets.

3.25 In addition, it is a condition of the NGSO network licence (under condition 8.2) that licensees cooperate with other NGSO licensees in order to mitigate the risk of harmful interference. Should harmful interference occur, condition 8.3(b) of our NGSO network licence already gives Ofcom the power to require licensees to cease or change the way it operates⁹. We do not specify which actions a licensee may be requested to take as these will depend on the circumstances and nature of the interference.

⁸ There are a range of techniques that can be used by operators to ensure coexistence between two NGSO systems, including angle avoidance, separation distances, satellite diversity, gateway diversity, reverse polarisation, spectrum splitting.

⁹ We may by notice instruct licensees to cease or change the use of particular equipment or radio frequencies which are authorised under a wireless telegraphy licence (including but not limited to radio frequencies authorised under the NGSO network licence) and are used by any part of the satellite system.

3.26 Further, given we do not impose specific technical conditions when licensing GSO earth stations to ensure other co-frequency satellites are protected, we do not consider it proportionate to add more specific technical conditions to the NGSO gateway licence.

Coexistence with future NGSO systems

3.27 Our process for considering NGSO gateway licence applications (and requests to vary NGSO licences) recognises that it is not possible for an applicant to know the future plans of other operators. An applicant's proposed approach to coexistence cannot therefore be detailed and specific at this stage.

3.28 Nevertheless, we expect applicants to set out clear principles for appropriately mitigating interference issues, to demonstrate that their system has the flexibility to accommodate new entrants, if required. This will ensure they can meet the terms of their licence if and when additional NGSO operators apply to operate services in the UK. We therefore require applicants to:

- explain how their existing network design and operating model might facilitate coexistence with future NGSO systems, as well as any limitations;
- outline any additional measures for improving coexistence with future NGSO systems; and
- take reasonable measures to accommodate future NGSO systems, in order to avoid material degradation to services in the UK.

3.29 As explained in paragraph 3.20, Starlink asserts that its gateways can operate in close proximity with other NGSO gateways (the techniques Starlink uses to coexist with other NGSO systems are listed above, including directional antennas and use of shielding).

3.30 We set out our initial view in the Starlink consultation that the techniques described enable its NGSO system to have the necessary flexibility to accommodate future NGSO systems, and that its plans to expand antennas (and corresponding beams) at four gateways should not unduly affect future licensees.

3.31 We asked the following question to gather input from stakeholders:

Consultation question 2

Are the measures set out by the applicant to enable coexistence with future NGSO systems reasonable?

Consultation responses

3.32 We did not receive any responses to question 2. We did receive comments about coexistence with both current and future NGSO systems, and these have been addressed in our assessment of question 1 responses above.

Our assessment

3.33 We continue to consider that the techniques described enable Starlink's NGSO system to have the necessary flexibility to accommodate future NGSO systems.

Conclusion on NGSO coexistence

- 3.34 We maintain our view that Starlink has provided the necessary evidence to reassure us that its expanded NGSO gateways will have the technical capabilities to coexist with existing (and future) NGSO licensees in the UK, that it intends to cooperate with other NGSO licensees and that its NGSO system has the flexibility to mitigate harmful interference to other NGSO systems. We are also satisfied that the existing conditions in NGSO licences provide us with the necessary powers to intervene to resolve harmful interference if required.
- 3.35 We encourage licensees to engage in ITU coordination discussions in good faith to ensure coexistence with other NGSO licensees. We will be monitoring the progress of these coordination discussions, as we do for all our NGSO licensees.

4. Assessing the impact on competition

- 4.1 Our NGSO licensing process explains that our starting position for assessing competition is to authorise applications where possible. We take the following four factors into account:
- the extent of the likely risks to competition;
 - the potential benefits from granting NGSO licence applications;
 - ensuring that time and resources devoted to the licensing process are proportionate to the risks and benefits; and
 - that NGSO services are currently in their infancy.

Risks to competition

- 4.2 In our [2022 Starlink NGSO gateway statement](#) we considered a range of potential impacts on competition, and our overall assessment was that there was a low risk to competition from approving the NGSO gateway licences. Our competition assessment in the [Starlink consultation](#) compared the facts of Starlink's licence variation request against the facts in the 2022 NGSO gateway statement, considering six potential competition risks:
- **Potential risk 1:** Starlink occupying all or most of the available gateway earth station sites, potentially blocking future entrants from accessing the market.
 - **Potential risk 2:** Starlink occupying preferential sites, raising the cost of entry to subsequent entrants.
 - **Potential risk 3:** Starlink's potential requirement for large separation distances between its gateway earth station(s) and that of others, thereby blocking potential sites to future entrants.
 - **Potential risk 4:** Strategic licence application for gateway earth station sites which an operator does not plan to use, in order to deliberately block future entrants.
 - **Potential risk 5:** Planned global expansion of the Starlink NGSO system preventing potential entrants deploying smaller, lower priority constellations in space in the future.
 - **Potential risk 6:** Starlink's vertical integration affecting competition in the supply of satellite broadband to UK customers given its parent company's (SpaceX) involvement in satellite launch services.
- 4.3 In the Starlink consultation, our initial assessment of **potential risks 1, 2 and 4** was that these risks were unlikely to develop, because Starlink is not proposing to occupy any new NGSO gateway sites and has surrendered two of its NGSO gateway licences.
- 4.4 Our initial assessment of **potential risk 3** was that as Starlink's NGSO system does not require a standard (large) geographic separation between its gateway earth stations and those of other NGSO systems operating at the same frequencies, this risk was also unlikely to develop.

- 4.5 In relation to **potential risk 5**, we considered that for Starlink’s licence variation request to raise competition concerns in the UK:
- approving this request would need to drive the deployment of a sufficient proportion of satellites in Starlink’s Gen2 NGSO system; and
 - this deployment of satellites would need to harm competition in the UK.
- 4.6 Our preliminary view on potential risk 5 was that approving or refusing Starlink’s licence variation request is unlikely to materially affect the number of satellites Starlink launches¹⁰ or operates. This is because first, Starlink has already deployed more satellites to meet global demand (under its Gen2 constellation) without requesting additional antennas in the UK. Given that and other evidence submitted by Starlink, our view was that satellite constellations drive the demand for gateways, rather than the other way around.
- 4.7 Second, if we were to decline this licence variation request, Starlink could deliver additional capacity on the ground by deploying gateways in neighbouring countries. As above, in this counterfactual the number of satellites Starlink operates is unlikely to materially change. However, it could preclude UK consumers from realising some benefits associated with having ground capacity on NGSO gateways in the UK, such as improved latency.
- 4.8 In relation to **potential risk 6**, we considered a hypothetical concern that the licence variation request represents an intent to expand Starlink’s UK presence i.e. serve more UK customers, which might increase its incentive to engage in input foreclosure¹¹. The standard test for input foreclosure asks whether:
- a) a firm would have the ability to use its control of inputs to harm the competitiveness of its downstream rivals;
 - b) a firm would have the incentive to actually do so, i.e. it would be profitable; and
 - c) the foreclosure of these rivals substantially lessens overall competition.
- 4.9 These are cumulative conditions - all must be met for there to be a competition concern.
- 4.10 We considered that for Starlink to have the ability to foreclose rivals it would need to have upstream market power and the input (satellite launches) must be important to downstream rivals’ ability to provide services to its customers. While satellite launches are important for commercial satellite operators (i.e. rivals to Starlink), our preliminary view was that SpaceX has already provided (or is contracted to provide) launch services for a number of its competitors – including NGSO operators wishing to provide a service in the UK – and that other launch operators such as Arianespace, ILS, Indian Space Research Organisation’s Polar Satellite Launch Vehicle and Rocket Lab are credible alternative launch providers for third parties.¹²
- 4.11 On the potential incentive for Starlink to engage in input foreclosure, we did not consider this would materially change if we approved the licence variation requests, compared to the counterfactual of not approving these requests. First, in the counterfactual of denying the application we considered that Starlink could take alternative steps to meet its capacity

¹⁰ In the case of launches it would be Starlink’s upstream business, SpaceX.

¹¹ Input foreclosure refers to a situation where an upstream division (i.e. satellite launches) of a vertically integrated firm either stops supplying inputs to rivals of its own downstream division (i.e. provider of satellite broadband) or continues to supply the inputs but at higher prices.

¹² Though we understand that none currently have a launch frequency comparable with that of SpaceX.

needs, such as by building gateways in neighbouring countries. As a result, the incentive is unlikely to change depending on our licencing decision. Second, we considered that the additional incentive from a larger presence in the UK from the application being approved is likely to be small when compared against the potential ‘cost’ of such a strategy. Here, the cost would be the loss of global sales of satellite launches to its downstream rivals.

- 4.12 We did not conclude on whether Starlink does or does not currently have the ability to engage in input foreclosure (whether total or partial). However, our initial view was that approving the variation request would not change SpaceX’s incentive to engage in input foreclosure, compared to the counterfactual of not granting the licence. Therefore, our initial view was that there is a low competition risk in relation to potential input foreclosure.
- 4.13 Overall, our initial view in the Starlink consultation was that there is a low competition risk arising from approving Starlink’s licence variation request.

Benefits

- 4.14 In the Starlink consultation we noted Starlink’s view that the upgraded NGSO gateway sites will help to close the digital divide in the UK and in the broader region, especially in connecting the ‘hardest to reach’ premises. In addition, Starlink believes the upgraded sites will enhance its cellular backhaul capabilities and support its new direct-to-mobile service (pending regulatory approval), and provide more connectivity options for consumers, leading to more competitive pricing and technological innovation.
- 4.15 Our preliminary view was that approving Starlink’s licence variation request would benefit UK citizens and consumers by increasing the availability of high-quality broadband services. We asked stakeholders the following question in the Starlink consultation:

Consultation question 3

Do you expect that granting this variation request would adversely affect competition? If so, please explain why.

Consultation responses

- 4.16 We received one non-confidential response from Viasat to question 3. Responses to questions 1, 2 and 5 from Viasat and a confidential respondent were also relevant to our assessment, so key points are repeated below, although they are dealt with predominantly in sections 3 and 5. We did not receive any responses to potential risks 1 to 5, or relating to the benefits of competition. We summarise the responses relevant to our competition assessment below.
- 4.17 **Increasing risks of harmful interference** – as noted in paragraph 3.14, Viasat suggests that Starlink’s licence variation request represents a threat to NGSO spectrum sharing within the UK as its gateway links have the potential to ‘blanket the sky’, causing many in-line interference events, limiting, and sometimes completely blocking, other NGSO systems from sharing the same spectrum. Viasat considers that this can harm innovation, industry growth, and the broader public interest.
- 4.18 **Limiting access to orbital resources** – Viasat further suggests that operators of large NGSO systems like Starlink (especially when supplemented by Gen2) have little incentive to avoid

in-line interference events, which could hinder other satellite operators, including new entrants, from accessing and using shared spectrum and orbital resources.

- 4.19 **Protecting GSO networks** – as noted in paragraph 5.7, a confidential respondent highlights that Starlink’s licence variation request is likely to increase aggregate interference towards GSO operators in the UK, significantly degrading GSO services and affecting the viability of GSO network services in the UK.

Our assessment

- 4.20 As noted above, we did not receive any responses on potential risks 1 to 5, and therefore our view on those risks is unchanged from the consultation stage. Our assessment of concerns raised by respondents as well as potential risk 6 (Starlink’s vertical integration) is presented below.

Increasing risks of harmful interference

- 4.21 Our view on the risks of interference is addressed in section 3 (from paragraph 3.19). Therefore, we consider the competition risk arising from harmful interference is low.

Limiting access to orbital resources

- 4.22 As set out under potential risk 5 above, we consider that approving or refusing Starlink’s licence variation request is unlikely to materially affect the number of satellites it launches or operates. Accordingly, approving this licence variation request is unlikely to affect new entrants’ ability to access and use shared spectrum and orbital resources.
- 4.23 In relation to Viasat’s concern over avoiding in-line interference events, we discuss Starlink’s incentives (and abilities) in section 3. We also note the responsibility for ensuring that satellite operators comply with their ITU obligations, including managing coexistence between satellite filings, and shared use of space resources, ultimately rests with the notifying administration responsible for the NGSO system.
- 4.24 Therefore, we consider the competition risk from this concern is low.

Protecting GSO networks

- 4.25 As set out in section 5 (see paragraph 5.13), conditions in Starlink’s NGSO network licence are intended to prevent harmful interference into co-channel and adjacent band spectrum users, and give us powers to address any coexistence issues should they arise. In particular, we updated our NGSO gateway licence to better protect existing GSO services, with an explicit condition 3.1(d) requiring compliance with Article 22 of the ITU Radio Regulations.¹³ We expect all NGSO gateway licensees to comply with their licence conditions to protect existing services including GSO networks when operating within the UK.
- 4.26 On this basis, we conclude that the competition risk stemming from this concern is low.

¹³ A corresponding licence condition 3.7(p) is also included in the NGSO network licence.

Starlink's vertical integration

- 4.27 Although we did not receive any comments on this specific risk, for completeness, we have considered a related hypothetical concern. In particular, that SpaceX's presence in the satellite launch market might give Starlink bargaining power in its coordination discussions with other NGSO operators, to the detriment of Starlink's satellite broadband competitors.
- 4.28 We considered whether approving this licence variation request could affect Starlink's ability or incentive to negotiate better terms during coordination discussions. For the same reasoning as summarised under potential risk 6 above, we conclude that approving Starlink's licence variation request is unlikely to change SpaceX's position in the satellite launch market or its incentives to negotiate better terms during coordination discussions, compared to the counterfactual of not approving the request.
- 4.29 Therefore, our view on this overall risk is unchanged from the consultation stage.

Benefits

- 4.30 As we received no additional information from respondents, we remain of the view that approving Starlink's licence variation request would benefit UK citizens and consumers by increasing the availability of high-quality broadband services in the UK.

Conclusion on competition

- 4.31 For the reasons set out above, we conclude the competition risks from approving Starlink's licence variation request are low. In addition, we consider that the upgraded NGSO gateway sites would benefit UK citizens and consumers.

5. Other consultation questions

Additional comments

- 5.1 We gave respondents the opportunity to offer any other views on this variation request.
- 5.2 Although not a requirement of our licensing process for NGSO gateway licences, we noted in the Starlink consultation that its variation request does recognise its international obligations to protect other co-frequency spectrum users.
- 5.3 Further, we assessed in the Starlink consultation whether the request to increase the number of antennas at some gateway locations would alter our view that Starlink would be able to protect GSO networks (we also considered any impact on fixed links operating in the same frequencies).
- 5.4 Our initial view was that Starlink’s licence variation request should not unduly affect existing users, nor its international obligations to protect GSO networks and fixed links (or its ability to do so in the future). We asked stakeholders:

Consultation question 4

Do you have any additional concerns or comments regarding the variation request?

Consultation responses

- 5.5 We received two responses: one confidential and one non-confidential from Viasat to question 4, raising the following points in relation to impacts on GSO networks:

Managing increasing risks of interference into GSO networks

- 5.6 Similar to the risks Viasat raises under question 1 for NGSO coexistence, it considers that increasing the number of antennas operating at Starlink’s NGSO gateway sites would also worsen the risk of harmful interference into GSO networks.
- 5.7 In addition, a confidential respondent highlights concerns over Starlink’s ability to comply with the protections set out for GSO networks under Article 22 of the ITU Radio Regulations, and the update to Resolution 76 from WRC-23¹⁴ for managing aggregate interference, given the proposal to increase the number of antennas on gateway sites. This respondent also requests that we make participating in Resolution 76 coordination meetings a condition of NGSO licences.

Ensuring licensees meet their national and international obligations

- 5.8 Viasat considers that the current international regulatory framework allows stakeholders to ‘game’ the process, and queries whether we are able to ensure applicants are meeting their obligations under our current NGSO licensing process. It notes it is not possible for the ITU to check all details in operators’ studies and suggests this may create challenges for the ITU when critiquing a stakeholder’s findings (and us when assessing our NGSO licence applications). Viasat suggests therefore that we conduct our own technical analysis to increase our oversight for managing potential interference into GSO networks.

¹⁴ World Radiocommunication Conference held in November and December 2023.

- 5.9 In particular, Viasat highlights a number of areas where it considers Starlink's licence variation request is inconsistent with data provided in its satellite filings:
- **EPFD evaluation** – Viasat believes one of the PFD masks in Starlink's Gen2 satellite filing, is artificially designed to create favourable outcomes. For example, it considers the satellite filing is designed to have a 'worst case geometry'¹⁵ and declared alpha angle¹⁶ that are more favourable than in the real world scenario. Viasat also notes that the relevant satellite filing is still due for EPFD evaluation by the ITU.
 - **Earth station density** – Viasat suggests that the earth station density for Starlink's constellation is higher by a factor of 15, compared to what is permitted in its USASAT-NGSO-3X satellite filing.
 - **Maximum number of antenna beams** – Viasat notes that the higher number of beams on the Isle of Man site (40) exceeds the total permitted under Starlink's satellite filing.
 - **Distances between gateway sites** – Viasat comments on the proximity between some of Starlink's gateway sites (i.e. being closer than the average distance of 270 km between gateway sites stated in its satellite filing). For example, it notes a distance of 90 km between Starlink's Wherstead and Woodwalton gateway sites.

Our assessment

Managing increasing risks of interference into GSO networks

- 5.10 As we acknowledge in paragraph 2.9, increasing the number of antennas (and corresponding beams) at four gateway sites has the potential to increase the risk of harmful interference for satellite operators, including GSO operators; this was a key reason for consulting on Starlink's licence variation request.
- 5.11 Having assessed Starlink's licence variation request, we still consider Starlink is capable of protecting GSO networks. We are also satisfied that our licence conditions, monitoring and compliance functions, together with the relevant international rules and obligations, provide an appropriate framework for managing interference risks and addressing any issues should they arise.
- 5.12 As set out in previous NGSO licensing statements¹⁷, regardless of the number of antennas in one site, or of the number of beams pointing from satellites to that site, it is reasonable for us to expect Starlink will comply with the ITU Radio Regulations and protect GSO networks under the relevant provisions, specifically Article 22 and Resolution 76. These international obligations apply to all satellite operators, and the notifying administration responsible for the NGSO system is ultimately responsible to ensure such compliance. The update to Resolution 76 at WRC-23 mandates that notifying administrations hold regular consultation meetings to ensure compliance with the aggregate EPFD limits to protect GSO networks and in light of this we do not consider it necessary or proportionate to add an additional licence condition at this time.

¹⁵ Refers to the location of the GSO earth station and GSO satellite that causes the highest single-entry EPFD value in the examination of the filing using Recommendation ITU-R S.1503.

¹⁶ Refers to the minimum angle at a GSO earth station between the line to the NGSO satellite and the lines to the GSO arc.

¹⁷ For example, see [Rivada Space Networks GmbH](#), [Mangata Edge Ltd](#), and [Telesat LEO Inc.](#)

- 5.13 Regarding operations within the UK, conditions in our NGSO network licence are intended to prevent harmful interference into co-channel and adjacent band spectrum users and give us powers to address any coexistence issues should they arise. In particular, we [updated our NGSO network licences in 2023](#) to better protect existing services, with an explicit licence condition requiring compliance with Article 22 of the ITU Radio Regulations.¹⁸ We therefore expect all NGSO licensees (including Starlink) to comply with licence conditions to protect existing services including GSO networks when operating within the UK, irrespective of the number of satellite filings under which they operate or the details of such filings. This condition also applies if the satellite filing(s) are modified.
- 5.14 Starlink is the only NGSO service currently operating in Ka band in the UK, though other services are expected to commence operating in the next two years. We expect all NGSO licensees using the same frequencies to cooperate in order to meet the aggregate interference limits set out in Resolution 76.
- 5.15 We are satisfied that the existing conditions in NGSO licences give us sufficient power to act should enforcement be necessary. We may use our powers to access and inspect sites, revoke licences, or we may modify, restrict, or closedown services. Where the conditions of NGSO licences are breached, we can impose financial penalties, or licensees may also face criminal prosecution. Harmful interference into licensed networks can be reported to our [Spectrum Monitoring Centre](#), and we are also developing new national capabilities to monitor and measure NGSO systems in the future.

Ensuring licensees meet their national and international obligations

- 5.16 As noted in paragraph 2.1, our NGSO licensing process was designed in part to enhance our ability to intervene where harmful interference arises, and we acknowledge the importance of carrying out appropriate technical checks. Under our process, we assess whether applicants provide sufficient information to form a view on the credibility of their studies and plans for coexisting with other satellite services; where we deem that information to be insufficient, we request further information.
- 5.17 In response to Viasat's suggestion to carry out a more detailed technical assessment, this is similar to previous remarks made¹⁹. In the absence of new evidence, we are not persuaded to change our approach, so do not consider it necessary to make changes to our NGSO licensing process to increase our oversight for managing interference into GSO networks.
- 5.18 Regarding Viasat's specific concerns about consistency with Starlink's satellite filings data, and in line with our position in paragraphs 3.16 and 5.13 above, we note that Article 22 requires Starlink to comply with aggregate interference limits irrespective of any changes to the design of its system. Our licence conditions reinforce this international obligation.
- 5.19 Based on the evidence provided by Starlink in its licence variation request, we are satisfied that it has reasonable measures in place to avoid harmful interference into GSO networks. We further note the steps it has taken to coordinate its NGSO system with other UK NGSO

¹⁸ Our 2023 update included new condition 3.7(p) requiring NGSO satellites and gateway earth stations to comply with the relevant EPFD limits in Article 22 of the ITU Radio Regulations. A similar condition was included in NGSO gateway licences (condition 3.1(d)).

¹⁹ We note that the points made by Viasat relate mainly to the licensing process and are very similar to comments made and considered by us in our 2021 NGSO Statement, 2022 Space Spectrum Strategy, 2022 Starlink NGSO gateway statement and 2023 NGSO network licence update.

licensees and co-frequency earth station sites. We are also satisfied that our existing NGSO licence conditions are sufficient and that we have appropriate powers to act to manage harmful interference into services sharing the Ka band in the UK, including GSO networks.

Conclusion on impact on other services

- 5.20 Having assessed stakeholder responses, we remain of the view that Starlink’s NGSO system is capable of protecting other services, including GSO networks and fixed links. We are satisfied that varying Starlink’s NGSO gateway licences should not unduly affect existing licensees in the UK, and that Starlink has provided sufficient reassurances to that effect. We are also satisfied we are able to take action to address harmful interference where it arises.

Equality and Welsh language impact assessments

- 5.21 We also assessed the likely impacts and benefits of approving Starlink’s request to vary four of its NGSO gateway licences on persons sharing protected characteristics, and on the Welsh language, as set out in Annex 1 of the Starlink consultation. We did not identify any adverse impacts on persons sharing protected characteristics that meant they are likely to be affected in a different way to the general population, nor did we consider that our proposals had any impact on our Welsh language obligations. We asked stakeholders the following questions:

Consultation question 5

Do you agree with our assessment of the potential impact on specific groups of persons?

Consultation question 6

Do you agree with our assessment of the potential impact of our proposal on the Welsh language?

Consultation responses

- 5.22 Neither respondent commented on our impact assessments under questions 5 or 6.

Our assessment

- 5.23 We remain of the view that approving Starlink’s request to vary its NGSO gateway licences will not have any adverse impact on persons sharing protected characteristics, reduce opportunities for persons to use the Welsh language, nor does it treat the Welsh language any less favourably than the English Language. Our full reasoning is set out in Annex 1 of this statement.

6. Our decision

How we decide whether to grant an NGSO gateway licence

- 6.1 Our 2021 NGSO statement explains the considerations we would take into account when deciding whether to grant an NGSO licence (in this case whether to approve a request to vary an NGSO licence):
- a) our technical coexistence checks;
 - b) our competition check;
 - c) our impact assessments²⁰;
 - d) our statutory duties, as set out in section 3 of the Wireless Telegraphy Act 2006 and section 3 of the Communications Act 2003, with our principal duty being to further the interests of citizens and consumers in relation to communications matters;
 - e) our NGSO licensing objectives, including to enable citizen and consumer benefits arising from innovative satellite services, such as improved connectivity; and
 - f) any other available relevant evidence, including the application, consultation responses and any further information provided by the applicant.

Our decision and next steps

- 6.2 In light of the evidence presented in Starlink's licence variation request, and our careful consideration of potential coexistence and competition issues, impact assessments and consultation responses, we have decided to approve Starlink's request to vary four of its NGSO gateway licences, located at Fawley, Wherstead, Woodwalton and the Isle of Man.
- 6.3 We will now proceed to vary Starlink's four NGSO gateway licences – for the Fawley, Wherstead, Woodwalton and Isle of Man sites. A copy of the four varied licences will be available under the "Existing licences" section of our [NGSO licensing webpage](#).

²⁰ See Annex 1 for full details of the impact assessments carried out.

A1. Impact assessments

Impact assessment

- A1.1 Section 7 of the Communications Act 2003 (the Act) requires us to carry out and publish an assessment of the likely impact of implementing a proposal which would be likely to have a significant impact on businesses or the general public, or when there is a major change in Ofcom’s activities.
- A1.2 Impact assessments form part of good policy making and we therefore expect to carry them out in relation to a large majority of our proposals. We use impact assessments to help us understand and assess the potential impact of our policy decisions before we make them. They also help us explain the policy decisions we have decided to take and why we consider those decisions best fulfil our applicable duties and objectives in the least intrusive way. Our [impact assessment guidance](#) sets out our general approach to how we assess and present the impact of our proposed decisions and section 4 of our [2021 NGSO statement](#) sets out how we assess the impact of applications (and variations) for NGSO licences.
- A1.3 We have carefully considered the potential impact of approving Starlink’s request to vary its NGSO gateway licences throughout the consultation and decision process. We assessed the potential benefits of Starlink’s licence variation request on citizens and consumers, as well as the potential risks posed to coexistence with other services and competition in section 2 of [the Starlink consultation](#). We set out our assessment and final decision in sections 3-6 of this statement, taking into account Starlink’s licence variation request, comments we received in response to our consultation and further information from Starlink.
- A1.4 As outlined in sections 3-6 of this document, we have concluded that our decision to approve Starlink’s request to vary four of its NGSO gateway licences is likely to have an overall positive impact for citizens and consumers, by enabling the provision of satellite connectivity services to a greater number of households, businesses and government customers across the UK. We do not consider that our decision will have a detrimental impact on stakeholders. We also assess that Starlink is unlikely to cause harmful interference to other services in the frequencies it intends to use.

Equality impact assessment

- A1.5 We have given careful consideration to whether our decision will have a particular impact on persons sharing protected characteristics (broadly including race, age, disability, sex, sexual orientation, gender reassignment, pregnancy and maternity, marriage and civil partnership, and religion or belief in the UK, and also dependents and political opinion in Northern Ireland), and in particular if they may discriminate against such persons or impact on equality of opportunity or good relations. This assessment helps us comply with our duties under the Equality Act 2010 and the Northern Ireland Act 1998.
- A1.6 When thinking about equality we think more broadly than persons that share protected characteristics identified in equalities legislation and think about potential impacts on various groups of persons (see paragraph 4.7 of our [impact assessment guidance](#)).

- A1.7 In particular, section 3(4) of the Act requires us to have regard to the needs and interests of specific groups of persons when performing our duties, as appear to us to be relevant in the circumstances. These include:
- the vulnerability of children and of others whose circumstances appear to us to put them in need of special protection;
 - the needs of persons with disabilities, older persons and persons on low incomes; and
 - the different interests of persons in the different parts of the UK, of the different ethnic communities within the UK, and of persons living in rural and in urban areas.
- A1.8 We also examine the potential impact our policy is likely to have on people, depending on their personal circumstances. This assists us in making sure that we are meeting our principal duty of furthering the interests of citizens and consumers, regardless of their background and identity.
- A1.9 Our decision to approve Starlink’s licence variation request facilitates further access to satellite broadband connectivity for a greater number of households, businesses, and government customers in the UK (details can be found in the [annex to Starlink’s licence variation request](#)). Taking account of stakeholder responses, we confirm our view set out in the Starlink consultation that this decision is likely to have particularly positive impacts on groups of persons living in more rural or remote areas including in Scotland, Wales and Northern Ireland, and improve equality of opportunity in those areas. We have not identified any adverse impacts on specific groups of persons that are likely to be affected in a different way to the general population.

Welsh language impact assessment

- A1.10 We are required to take Welsh language considerations into account when formulating, reviewing, or revising policies which are relevant to Wales (including proposals which are not targeted at Wales specifically but are of interest across the UK).²¹
- A1.11 Where the Welsh Language Standards are engaged, we consider the potential impact of a policy proposal on (i) opportunities for persons to use the Welsh language; and (ii) treating the Welsh language no less favourably than the English language. We also consider how a proposal could be formulated to have or to increase, a positive impact, or not to have or to decrease any adverse effects.
- A1.12 We consider our decision to vary Starlink’s NGSO gateway licences will not have any impact on our Welsh language obligations, as it relates to a nationwide licensing regime and the relevant licence products are available for anyone within the UK to apply.
- A1.13 We note that our current practice is to produce spectrum licences in Welsh when requested, in accordance with our obligations set by the Welsh Language Commissioner. We will continue to take this approach in relation to NGSO licences.

²¹ See Standards 84-89 of [Hysbysiad cydymffurfio](#) (in Welsh) and [compliance notice](#) (in English). Section 7 of the Welsh Language Commissioner’s [Good Practice Advice Document](#) provides further advice and information on how bodies must comply with the Welsh Language Standards.