

## Your response

Question	Your response
<b>Question 1: Are there other trends in the space sector (or the broader spectrum environment) that we should monitor and/or take account of in our strategy?</b>	<p>The Space Energy Initiative (SEI) welcomes the opportunity to comment on the Space Spectrum Strategy which Ofcom published in March 2022 (“Strategy”).</p> <p>The SEI<sup>1</sup> will lead the development of Space Based Solar Power (SBSP) for the UK and beyond, offering large scale, safe, and secure energy day and night, through all seasons and weather. Through a structured and collaborative programme of design, research and technology demonstration, the SEI will promote integration and innovation between Space, Energy, Digital, and Manufacturing ecosystems.</p> <p>SBSP is the concept of harvesting free solar energy in space, beamed to Earth safely as microwaves, collected and converted to electricity for the Grid, each satellite equivalent in output to a large coal power station.</p> <p>The UK has set out an ambitious national clean energy policy – Net Zero – to fully decarbonise the economy by 2050. In this context Space Based Solar Power offers a range of characteristics which could help the UK deliver Net Zero, with a new source of abundant, sustainable power.</p> <p>While the ITU and CEPT have developed over recent years several recommendations and guidance on the frequency ranges for the operation of non-beam and beam Wireless Power Transmission (WPT) systems for mobile and portable devices, additional applications such as SBSP systems would require further work and guidance from spectrum management authorities.</p> <p>SEI requests OFCOM to take into account the development of SBSP technologies in UK and the associated spectrum requirements in its Space Spectrum Strategy. Specifically, the use of high-power RF from space (GEO, GSO, HEO) to large (and remote, e.g. offshore) receive arrays. Typically this will be in the 1 – 10 GHz bandwidth, with proposals widely suggesting the ISM bands of 2.54 GHz and 5.8 GHz. The power levels for operational systems will be in the region of 1 – 2 GW, and with peak power density at the ground receiver of 240 W/m<sup>2</sup>.</p> <p>SEI also invites OFCOM to monitor and facilitate access to spectrum for in-orbit servicing and assembly missions including machine-to-machine communications, which will be needed in the future for the implementation of SBSP. This comes under the general topics of space sustainability (debris removal, end-of-life management) and a</p>

---

<sup>1</sup> The members, activities, and other details about SEI can be found at <https://spaceenergyinitiative.org.uk/>

	growing in-space economy (assembly, repair, upgrade, and decommissioning).
<p><b>Question 2: Do you agree with the broad areas we have prioritised for our work?</b></p>	<p>SEI fully concurs with the proposed <i>work area 3: Understanding and enabling access to space</i> and OFCOM willingness to increase the focus of its strategy on wireless innovation and support innovative projects in the space sector by making it even easier for a broad range of users to access spectrum</p> <p>In particular, the focus outlined in paragraphs 5.68 and 5.69 on the identification of frequency bands and authorizations options for new cubesat/small sat applications could also be considered for other innovative projects and thus ease the implementation of associated proof of concept and demonstrators. SEI therefore recommends to broaden the interpretation of <i>innovation</i> and <i>space pioneers</i> to include novel concepts of any scale and beyond the conventional telecommunications sector.</p>
<p><b>Question 3: Are there other issues and actions that are likely to be important over the next 2 – 4 years?</b></p>	<p>In the next 2-4 years the identification of appropriate frequency bands and regulatory regime to operate SBSP capability will be a crucial milestone to enable and secure such concept and program in time to meet our sustainable energy goals. Securing access to spectrum during the 2020's (i.e. WRCs 2023 &amp; 2027), to support both prototypes / demonstrators and the operational use case, is a necessary confidence-building step for public and private investment in scaling up manufacturing and launch resulting in the First-Of-A-Kind station before 2035 and multiple systems in use by 2040, thus shifting the energy generation mix away from fossil fuels by 2050 (the Net Zero 2050 legal imperative). In order to realise these opportunities, it will be necessary to demonstrate a clear regulatory pathway for each stage of the development and implementation of SBSP systems and clarity on how (and how far) SBSP is affected by the OFCOM (and international) licensing frameworks.</p> <p>SEI therefore encourages OFCOM to include in its next Space Spectrum Strategy an additional action aiming “to understand what (if any) changes to radio regulations and international spectrum allocations and spectrum co-existence arrangements are needed to support applications of wireless power transmission via radio frequency beam in space and from space to earth”; and to work towards technical studies being undertaken before and after WRC-2023.</p> <p>These initiatives should include the introduction or clarification of experimental /development licences (or confirmation of alternative routes to operation) to facilitate early trials of SBSP and similar use cases.</p>
<p><b>Question 4: Do you have any evidence on whether specific actions should be a high priority?</b></p>	<p>The UK has made a legally binding obligation to achieve Net Zero by 2050, reinforced by commitments at the COP26 conference. However these Net Zero commitments are exceptionally challenging and it is recognised that innovation in new technology will be required. The independent study completed in April 2021 by</p>

	<p>Frazer-Nash on behalf of BEIS, confirms that SBSP is viable technically and economically, and can be developed in time to make a substantial contribution to Net Zero by 2050. However development needs to commence with urgency and with the right scale of funding. It is recognised that the allocation of Spectrum is likely to be a critical path item for the development, and is therefore very high priority. The SEI development programme calls for terrestrial power beaming demonstrations within the next two years, small scale power beaming from space within 3 years, and beaming substantial (MW scale) power from space to earth within six years.</p> <p>Early and urgent public sector engagement on spectrum is essential to build investor confidence that one of the important enabling issues is already being considered.</p>
<p><b>Question 5: Do you have any other issues you wish to comment on?</b></p>	<p>Potentially to be considered:</p> <ul style="list-style-type: none"> <li># do rectennas (and licensing thereof) need to be identified as a new type of earth station eligible for Recognised Spectrum Access?</li> <li># what would count as Bringing Into Use of an SBSP station? Would prototypes in LEO and precursors in GSO or HEO be sufficient, or is absolute PFD on ground to be proven?</li> <li># how would an SBSP operator need to demonstrate that its SBSP system would avoid harmful impacts on other spectrum users, whether or not it requires a spectrum licence?</li> <li># If SBSP is not consider under the umbrella of radio communications, how should we proceed with activity toward regulation and approval, including engagement with public safety ICNERP limits?</li> </ul>
<p><b>Question 6: Are there other issues and actions specifically relating to NGSO communication systems that are likely to be important over the next 2 – 4 years?</b></p>	<p>System studies are may be necessary to confirm that an SBSP beam passing through LEO altitudes on its way from GSO to Earth does not impact or is impacted by LEO satellites passing through the beam. Reflections of the 2GW beam may also need consideration for other sensing satellites.</p>
<p><b>Question 7: Do you have any evidence on whether specific actions relating to NGSO communication systems should be a high priority?</b></p>	
<p><b>Question 8: Do you have any other comments relating to NGSO systems?</b></p>	