Your response

Question	Your response
Question 1. How do you think demand for Shared Access is likely to change in future and why; Which use cases do you think are likely to emerge or grow, and which decline? Please provide a view on the bandwidth you would consider the minimum and optimal requirement for growth use cases, and timelines you would expect for their development	Federated Wireless, Inc. (Federated Wireless) appreciates the opportunity to provide input to Ofcom's Shared Access License (SAL) Framework consultation. We also appreciate Ofcom's Discussion Paper on dynamic or adaptive approaches to managing spectrum and will refer to certain sections of that paper in this response.

As Ofcom is likely aware, the demand for access to spectrum on a shared and/or lightly-licensed basis (without the need to compete in an auction or go through a manual licensing process) is growing rapidly. This demand is fueled by both commercial consumer-oriented services and by the proliferation of private wireless networks for a wide variety of industrial and social use cases.

In the United States, the Citizens Broadband Radio Service (CBRS) has seen exponential growth since its commercial launch in January of 2020. Today, there are over 330,000 CBRS devices, or CBSDs, deployed across the country with the vast majority of them operating in the license-by-rule General Authorized Access (GAA) portion of the band.

The Institute for Telecommunication Science (ITS), the research and engineering laboratory of the U.S. National Telecommunications and Information Administration (NTIA), recently released a report, entitled "An Analysis of Aggregate CBRS SAS Data from April 2021 to January 2023", available at https://its.ntia.gov/about-its/archive/2023/new-first-of-its-kind-report-provides-analysis-of-early-cbrs-deployment-data. This report provides "valuable insights into the growth of CBRS, the impact of dynamic spectrum sharing, the role of General Authorized Access (GAA) spectrum usage, and CBRS's role in rural wireless connectivity." |

	In this report, ITS states that "CBRS deployments grew at a steady rate with a mean quarterly increase of 12.0% and a total increase of 121% over the 21-month analysis period." ITS further noted that the "number of CBSDs with Priority Access License (PAL) grants grew consistently with a mean increase of 17% per quarter, but General Authorized Access (GAA) CBSDs dominated deployments. On January 1, 2023, four out of five active CBSDs were GAA-only, 85% of the active grants were GAA, and two-thirds of active CBSDs with a PAL grant had at least one active GAA grant."
	This impressive growth of CBRS spectrum usage, particularly in the GAA tier, clearly demonstrates the market demand for access to "carrier-grade" spectrum without the burden and costs associated with license acquisition. By "carrier-grade," we mean spectrum for which a 3GPP equipment ecosystem exists and whose technical rules permit significantly higher power transmit levels than what is allowed in traditional license-exempt bands.
	As Ofcom has reported, demand for SAL licenses in the United Kingdom is also increasing. Based on our experience with CBRS growth in the United States, we would expect SAL spectrum demand to continue to grow. The pace of that growth, however, may be dependent on the ease of spectrum access and availability of sufficient spectrum in bands where there is a thriving and competitive ecosystem.
	As Ofcom states in its Discussion Paper, the automation of the SAL licensing process should spur even faster growth and ongoing demand. We anticipate such demand for shared/lightly-licensed spectrum to emerge for a wide variety of private wireless network use cases in sectors ranging from agriculture to automotive, manufacturing to media, energy, retail, commercial real estate, schools, libraries, and civil society groups.
Question 2. Are there elements of the current framework that complicate the use of Shared Access licences for specific use cases? If so, please provide specific examples and indicate the changes that would be required to facilitate	In addition to automating the current manual application process for SAL licenses, Federated Wireless recommends that Ofcom consider adjusting its methodology for determining

this and how this might co-exist with other use cases.	whether a SAL user's proposed deployment would negatively impact other users.
	For example, Ofcom's current antenna modeling applies the maximum gain omni-directionally, which frequently results in overly conservative separation distances and less efficient spectrum usage. A 16 dBi antenna modeled in such a way effectively reduces sharing capacity (sterlisation) by 16 dB and limits spectrum re-use.
	In order to avoid overly conservative assumptions and resultant inefficiencies, we recommend that Ofcom consider the use of certified professional installers, like the FCC has required for the CBRS band, to ensure reliable, accurate installation information as part of a future automated SAL process.
	Furthermore, we recommend that Ofcom inform SAL applicants of the nature of any expected interference and allow the applicants to employ mitigations as they see fit, rather than denying the application or assuming that the applicant's QoS needs will not be addressed.
	Moreover, in our work with prospective SAL users, we have heard that applications have been denied due to potential interference to incumbents. Upon further study, it was discovered that the incumbents being protected were the applicant's own sites. We therefore recommend that Ofcom reconsider its approach of denying applications and instead consider flagging potential issues and allowing the applicant to provide additional information and/or take on risks or mitigation themselves.
	Finally, we note that the current manual application process makes SAL spectrum less suitable for events requiring spectrum access for short periods of time and/or for near-term events.
Question 3. Do you have any comments on the power restrictions currently in place, particularly in urban/high density areas, under the Shared Access licence? Please explain what benefits could be delivered using a higher	Under the current SAL framework's first-come-first-serve approach, permitting higher transmit powers in dense areas may increase coverage and decrease initial deployment costs, but will

operating power (e.g. medium power in urban areas), or any concerns you sharing with such operations).	also reduce spectrum availability for subsequent users. Given this trade-off, we recommend that Ofcom consider implementing DSMS tools to manage access to SAL spectrum more actively and respond to different users' needs over time. Were operators to renew their spectrum requests regularly via a closed loop system, aka routine "heartbeats," Ofcom could require and easily implement adjustments to operations as demand for spectrum increases. This type of closed loop operation is explicitly implemented in CBRS to enable sharing with incumbent services. However, it is also implicitly embedded in Ofcom's existing SAL rules given that Ofcom reserves the right to require changes in SAL operations upon a 30-day notice. This requirement has the same practical effect as a 30-day heartbeat for adjusting spectrum assignments. Given that Ofcom already has an adjustment mechanism in place, it might consider permitting higher power operations initially, which would improve coverage, and then use the 30-day notification window to reduce transmit powers to accommodate future demand for capacity. Use of an automated DSMS could cost efficiently and effectively manage this process. As part of the 5G New Thinking project, Federated Wireless demonstrated how an automated spectrum grant interface with a heartbeat mechanism can be used to update spectrum access policies for specific areas, times, and bands. This capability can be easily extended for automatic exception grants and management. To the extent that any SAL operators desire additional certainty for higher transmit power exceptions, Ofcom might consider imposing higher licensing fees for those exceptions.
Question 4. Do you have any comments on the exceptions process, and how some of its benefits could be maintained within more standardised and automated assessments?	We appreciate Ofcom's efforts to address the need for exceptions to its Shared Access conditions and we agree that automation of the application process will provide greater certainty and streamline response time. We do not, however, agree that the assumption that "increased automation may lead to a more rigid

	set of outcomes." Instead, by incorporating automated, dynamic sharing tools into the approval process, exceptions requests could be approved on an automated basis when no other users would be adversely impacted, and then later be rescinded were capacity for other users to become limited (e.g., applications being denied due to exceptional operations). Applicants for operations with exceptions would need to acknowledge this potential outcome as part of the approval process.
Question 5. Do you have any views whether and how the coordination approach should be modified? If yes, please provide comments in light of the issues set out above.	Federated Wireless recommends that Ofcom consider implementing license conditions that would incentivize users to have higher interference tolerance, thereby increasing spectrum efficiency and increasing access opportunities for more users. For example, Ofcom could identify a portion of spectrum available via the SAL process that does not provide interference guarantees. This would enable Ofcom to more authorize more operations that would otherwise qualify for an exception. These operations would only be allowed on the condition of interference tolerance (much like license-exempt operations do). Alternatively, Ofcom could lower regulatory fees for operations that are willing to accept interference.

Operator-to-operator co-existence (interference mitigation) could be coordinated by devices or managed via coexistence groups. For example, one type of coexistence coordination could include voluntarily matching TDD frame structures, which could be used as part of the channel assignment process. |
| **Question 6. Do you have views on whether newer or emerging technologies can support coexistence between additional users in the band, and if so, how?** | Please see our response to Question 5 above. |
| **Question 7. Please outline any comments on the current licensing process (e.g. ease of application, time taken, the information we require).** If relevant, please note aspects you are currently content with and areas which could be improved. | Federated Wireless notes that the CBRS spectrum inquiry and spectrum grant process permits users to make requests based on available spectrum as well as for specific blocks.

We recommend that, as part of its plans to automate the SAL process, Ofcom consider enabling similar inquiry capabilities. For example, the Federated Wireless supplemental |

	SAL tool, which we have demonstrated to Ofcom staff, enables a prospective user to make similar inquiries in advance of filing an application and includes a "demonstration mode" where specific blocks of spectrum can be requested and actively managed.
Question 8. Do you have any comments on the suitability of available spectrum for your use cases? Please consider the relevance of the additional bands we are proposing for the framework, and the impact of any limitations on existing bands.	Federated Wireless agrees with Ofcom's efforts to make more spectrum available in bands where there is an existing and growing ecosystem, such as in the 2.3 GHz and 3.8-4.2 GHz bands. We applaud Ofcom for working with MoD to identify how new uses could be permitted in the 2.3 GHz band while co-existing with their mission critical operations. However, we recommend that Ofcom consider relying on automated dynamic sharing tools, such as those that enable widespread shared use of the U.S. military's spectrum, without restricting commercial operations to low power indoor use. We stand ready to assist both Ofcom and MoD with making more intensive shared use of the 2.3 GHz band, leveraging our CBRS experience as well as ongoing work with the U.S. DoD to explore sharing for systems in the 3.1-3.45 GHz band, including airborne operations.
Question 9. Do you have any comments on equipment availability limiting deployment options in 3.8-4.2 GHz? Please comment on the impact of any experiences you have had, and where relevant, your expectations for when more equipment will be broadly available across the band.	We anticipate the ecosystem for standardized equipment operating across the 3.8-4.2 GHz band will continue to develop, especially as deployments in this band in other countries occur and as CEPT begins its work in earnest to identify sharing approaches, preferably automated, for the band.
Question 10. Do you have any other general comments on the Shared Access framework? Please consider any areas where future innovations could further support Ofcom's policy objectives for this spectrum, and/or improve the experience for users.	As Federated Wireless has mentioned in response to prior consultations, we recommend that the Shared Access framework incorporate as much automation as possible to: • Increase spectrum efficiency and density of usage (e.g., permitting re-use of frequencies to support both indoor and wide area operations in same geographic area and/or enabling more closely spaced deployments); • Process spectrum assignment requests at a speed and scale not possible with manual

processing, which will be critical to meet ongoing demand;

- Respond to changing demand across different classes of users and business models (e.g., some business models require only periodic, rather than consistent access to spectrum);
- Facilitate diverse private network deployments at scale by enabling licence applications to be made by third-party automated cloud-based services that rely solely on machine-to-machine interfaces;
- Collect timely, real-world data on noise floor, propagation, spectrum usage, and interference reports;
- Interface directly with Ofcom's licensing databases and other services, to ease access, management, and support of offline analysis objectives.

We have also heard requests from SAL users for supporting tools such as integrated license management across multiple licenses (as opposed, e.g., to an Excel spreadsheet), frequency planning, integration with GIS service availability (power, backhaul), inferred service maps, etc.

Ofcom need not develop such solutions from scratch but should consider leveraging the many commercially available and proven spectrum sharing solutions that are on the market today, as well as technology developed through funding from the Department for Digital, Culture, Media and Sport (DCMS) 5G Testbeds and Trials Programme.