Evolution of the Shared Access Licence Framework

Cellnex UK Response

May 2023

Overview of Cellnex UK

Cellnex Group

This response is submitted by Cellnex UK (link), part of Cellnex Group (link) which:

- Supports over 420 million mobile connections across Europe
- Operates >70,000 mobile sites today, which will grow to >130,000 by 2030
- Is Europe's leading neutral host mobile infrastructure provider, covering 12 countries: Austria, Denmark, France, Ireland, Italy, Netherlands, Poland, Portugal, Spain, Sweden, Switzerland and the UK
- Provides mobile infrastructure services, private and mission-critical networks, distributed antenna systems and small cells, and smart/IoT and innovative services
- Sixteen mission critical networks operated in Spain for Public Safety (emergency bodies)
- Forty private networks operated across Europe for Critical Business (enterprise)
- Had an annual turnover of €2.5bn in 2021
- Is listed on the main sustainability indices, and evaluated by highly reputable international analysts such as CDP, Sustainalytics, FTSE4Good, MSCI and Standard Ethics

Where possible, we have sought to provide international examples from the wider Cellnex Group in our response.

Cellnex UK

We are the trusted partner of all the major UK mobile network operators, hundreds of private businesses, the emergency services, as well as the UK Government, specifically Cellnex UK:

- Is the UK's leading independent wireless connectivity infrastructure company
- Operates >9,000 mobile sites today, which will grow to >13,000 by 2031
- Has deployed over 1,000 small cells to date
- Is a provider of private networks in campus and indoor environments
- Is an indoor mobile coverage provider, most notably in the Etihad stadium in Manchester
- Is deploying contiguous mobile coverage and capacity along the 81km Brighton to London Mainline and three major stations
- Has won three DCMS 5G competitions, working collaboratively with universities and start-ups to deliver 5G innovation
- Employs around 350 people across four major UK locations – Reading, Manchester, Scotland and Leamington Spa
- Has invested £6.1bn in the UK since 2016

Basis of Response and Introductory Comments

Cellnex UK has reviewed and commented on this call for input in our role as a provider of private networks, we have also drawn on expertise and insight from the wider Cellnex Group which is also deploying private networks across Europe.

Important Note: Within the UK our experience of the Shared Access Licence Framework ('SALF') has been exclusively with the 3.8 – 4.2 GHz band for the deployment of private networks, as a result our comments in this document relate only to this band and type of deployment.

Cellnex UK is highly supportive of the work that Ofcom has undertaken to date, via the SALF, to enable the deployment of private networks in the UK and the operational transformation and associated economic benefit these deliver. The market for private networks is now starting to scale and it appears to be reaching an inflection point.

As a result, it is timely that Ofcom has issued this call for input. Cellnex UK welcomes this opportunity to provide our views on the current operation of the SALF in the 3.8 – 4.2 GHz band and put forward suggestions for changes and improvements to enable the next phase of private network deployment across the UK.

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

1.1. Overall Demand

Cellnex UK is forecasting a significant increase in the number of private networks deployed in 2023 based on our growing sales pipeline and increased industry interest. In Q1 2023 we have qualified significantly more private network opportunities as compared to Q1 2022.

To date we have seen a relatively small number of sectors seeking to implement private networks, usually across campus or multi-tenanted building environments. We also note that in a number of situations organisations are seeking to both deploy a private network and enhance public mobile connectivity based on shared infrastructure and a neutral host model.

We forecast the number of sectors seeking private network solutions will increase from H2 2023 onwards as a result of reducing deployment cost and increased device availability. At this point, we will also see different physical deployment scenarios (e.g., smaller single tenant locations) and use cases (e.g., smart kitchen solutions in restaurants) emerge alongside 'out of the box' network solutions as has been seen in the USA; which will bring additional private network providers into the supplier market.

1.2. Sectors and Deployment Types

Within the UK we are seeing demand predominantly from the following sectors:

- Manufacturing, notably automotive and wide area campuses
- Logistics and transport, scale locations such as ports with high 'transaction' volumes
- Business parks, notably new builds targeting 'high-tech' firms
- Leisure/sporting venues, large location with high footfall and operational complexity
- Mining, wide area outdoor coverage for open cast activities

In terms of physicality of required deployments, the majority of interest has been campus environments (e.g. Basing View, link) followed by large, usually multi tenanted buildings.

Across our European business we are seeing similar early adopter sectors, such as transport (link), logistics (link), as well as mining (link) and manufacturing/construction (link)

1.3. Use Cases and Bandwidth Requirements

Initial use cases we have been involved with have focused on the following opportunities and benefits:

- Manufacturing – enabling operational flexibility and rapid reconfiguration for mass customisation and/or changes in demand, remote control/monitoring of machines, enhanced quality assurance, reduce energy consumption
- Logistics – remote control of assets/activity for greater operational efficiency, digital twin enablement to assist with real time planning and problem solving, enabling assisted based maintenance, improving safety and asset monitoring

- Business parks – increase attractiveness to potential high-tech tenants by offering a 'neutral host' solution where network slices can be allocated to tenants at their location and/or to test nomadic and mobility-based applications
- Leisure/sporting venues – operational requirements and enhanced user experience
- Mining – sensors, energy consumption, safety and environmental monitoring and autonomous operation

As the market develops, we believe new organisations within existing sectors (e.g., SMEs) and new sectors (e.g., wider hospitality) will deploy private networks along with associated new use cases; as a result, importantly the variety (e.g., smaller 'out of the box' solutions alongside larger multi sector solutions).

Bandwidth

Based on our experience to date existing use cases can be addressed by the available spectrum. Deployments Cellnex is involved in typically require 100 MHz of spectrum per transmitting sector as they are high volume/transaction environments. The features of which are a requirement for large bandwidth due to the volume of devices all operating concurrently with a need for low latency, lack of contention and service assurance.

Given the current high level of investment required to deploy a private network, along with often even greater costs to upgrade devices/equipment which connect to it (e.g., manufacturing lines) - and hence assurance of spectrum access and sufficient bandwidth to enable additional use cases and forecast increases in transaction volumes.

In the next c.2 years Cellnex UK does not envisage a need for allocation of >100 MHz per transmitting sector for private network usage, we note that other use cases may require this (e.g., fixed wireless access, small cell backhaul) which we comment further on in our response to Question 9.

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 this and how this might coexist with other use cases.

Cellnex UK notes the following four features of the current SALF which bring noticeable complexity and/or add additional costs when using the 3.8 – 4.2 GHz for private networks.

In our responses to Questions 3 and 4, we detail how, for nearly all current outdoor deployments in urban areas, we believe that the exceptions process will need to be utilised given current SALF restrictions. Whilst the exceptions process is part of the current SALF in the interest of brevity we do not comment on its operation and potential areas for improvement here, instead we detail this in our responses to Question 4 and 7.

2.1. Complexity of Accessing Medium Power Spectrum

Please see our responses to Question 3 and 4 for details on this.

2.2. Antenna Height Restrictions

The current 10m limit in urban environments limit presents a challenge in terms of (i) design complexity (ii) increasing base station/sector counts and associated deployment economics for outdoor use cases.

A real-life example of this is within a port environment, though the same would be true of other urban logistics and large-scale manufacturing operations. Within the port environment, there is a need to be able to provide coverage and capacity to the decks of container ships for personnel that are either the crane operator (i.e., working at height) or moving amongst the containers on the ship's deck.

Once landed the containers can be stacked five high resulting in a height of greater than 10m that presents as an obstruction to the propagation of signal. As a result, we need to rely on multipath to provide an uncertain level of throughput and increase the number of sites, and associated costs, required to meet the requirements of the use cases; such as automation of cranes, UHD camera feeds to identify damaged containers, provide asset tracking and support traffic management of lorries within the port, etc.

Other emerging use cases include drone operations across a campus environment and associated telemetry/camera feeds via flight paths, which are greater than 10m are also challenging this height restriction.

In addition to the high-capacity requirements detailed above, the 10m limit is also restrictive for instances where the use case is for wide area coverage at a low throughput requirement, such as for sensors or position information. In this scenario low antenna heights drive excessive base station counts and can make deployments uneconomic.

Removal of the restrictions would enable targeted placement of antennas at a height greater than 10m, in a manner where the potential interference to surrounding areas could be limited, resulting in an efficient, economic and robust private network deployment. Consideration should also be given to standardised approach to down tilts and the positive impact this would have in reducing interference.

Ofcom should review the 10m height limit and consider if a higher limit could be set by default, whilst in parallel developing its understanding/toolsets for higher antenna heights and downtilts to enable swifter decisions via the exceptions process.

2.3. Single Antenna Type Assumption

Please see our response to Question 5 for details on this.

2.4. Lack of Nearby Adjacent Licence Holder/Usage Information

Currently, potential users of spectrum are unable to understand, even at a high level, whether a solution will be viable or not in a location. Given the growing volume of interest and licencing in the 3.8 – 4.2 GHz, this has several implications:

- For third party providers (e.g. systems integrators and neutral hosts like Cellnex UK, as opposed to the 'operating' organisation directly deploying a private network) there is usually a requirement to engage in procurement activity and self-fund associated pre-sales costs, absent of any upfront viability information which has the potential to lead to significant cost which might result in no outcome if a solution cannot be found
- Secondly, for nearly all current outdoor urban deployments (e.g., campus/wide area outdoor), an exception process needs to be followed, without any information about usage nearby, this has the potential to result in 'wasteful' initial submissions and drive several rounds of design iteration before a solution is agreed. Greater information about nearby usage would reduce time and costs for all parties, including Ofcom

We recognise that Ofcom has confidentiality obligations to other licence holders, however we believe that the benefit which would be derived from having searchable information would outweigh the negative impact of a minor reduction in existing deployed system confidentiality. Cellnex UK suggests the following information already captured by the process is made available for each transmitting sector:

- Location
- Height
- Transmit powers (EiRP)
- Bandwidth

In addition, we suggest the following information is captured and made available, as it could provide key parameters in reaching a solution:

- Azimuth
- Antenna type (i.e., directional or omnidirectional, vertical and horizontal radiation pattern)
- Antenna tilt angle

As a further control mechanism, additional information could be made available to 'certified providers' who have met certain criteria (e.g., demonstration of RF design competence etc.) and agreed to legal conditions (i.e., non-disclosure, non-use of information for commercial gain etc.); this is a proposal we return to in Question 7 regarding improvements to the SALF exception process.

It is also worth noting that, during the exceptions process, it is required to provide information to show that all possible steps to minimise potential interference have been undertaken; which, without information, is an undefined target and, consequently, risks under or over engineering.

Ofcom should consider how it can make greater information available on existing deployment to 'certified providers' to enable (i) feasibility assessments to support 'go/no go' decisions for commercial bids (ii) considered scheme designs to be submitted under the exception process and avoid the current situation of multiple design iterations.

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 operating power (e.g. medium power in urban areas), or any concerns you sharing with such operations).

As noted throughout this response, we believe that given the current dominance of 'campus style' deployments in urban areas, access to medium power will nearly always be required to enable a technically viable economic solution. Without this equipment, costs rapidly escalate and lead to solutions which are not economically viable, and associated failure to realise the transformational use cases targeted. We expand on this via way of a case study below, acknowledging in 3.3. that 'uncontrolled/unplanned' access to medium power spectrum could result in spectrum not being used in a manner which maximises economic benefit.

3.1. Enabling Economic Site Counts

To date, we have seen significant demand for outdoor deployments in urban environments, these are typically 'campus' environments requiring multiple sectors. A technically viable solution with low power, would require substantial base station/sector counts. The subsequent require for deployment of additional hardware, significantly increases cost and complexity in areas such as physical deployment, hardware/licencing costs and overall systems optimisation/operation.

Below we detail, via a case study, how the use of low power from the number of economically viable locations, would have resulted in a solution which did not come close to meeting the technical requirements of the client organisation.

Case Study – Power Levels – Basing View Business Park

Basing View is a 65-acre business park which aims to be one of the best connected business destinations in the Southeast. It is home to more than 180 national and international businesses. A private network was required to support testing and use cases such as prescription delivery, automated vehicles and robotics alongside deployment of a state-of-the-art 5G living lab. Under a low power scenario, a 100MHz channel equates to 1.2W EiRP in an urban area which results in radio frequency propagation which is not of use, as shown below:

Figure 1 Useable Coverage for 100Mbps DL using Urban Transmit Power Limitation at height of 6m using directional antennas

In comparison medium power can transmit with c.80W EiRP, resulting in a technical and economic solution:

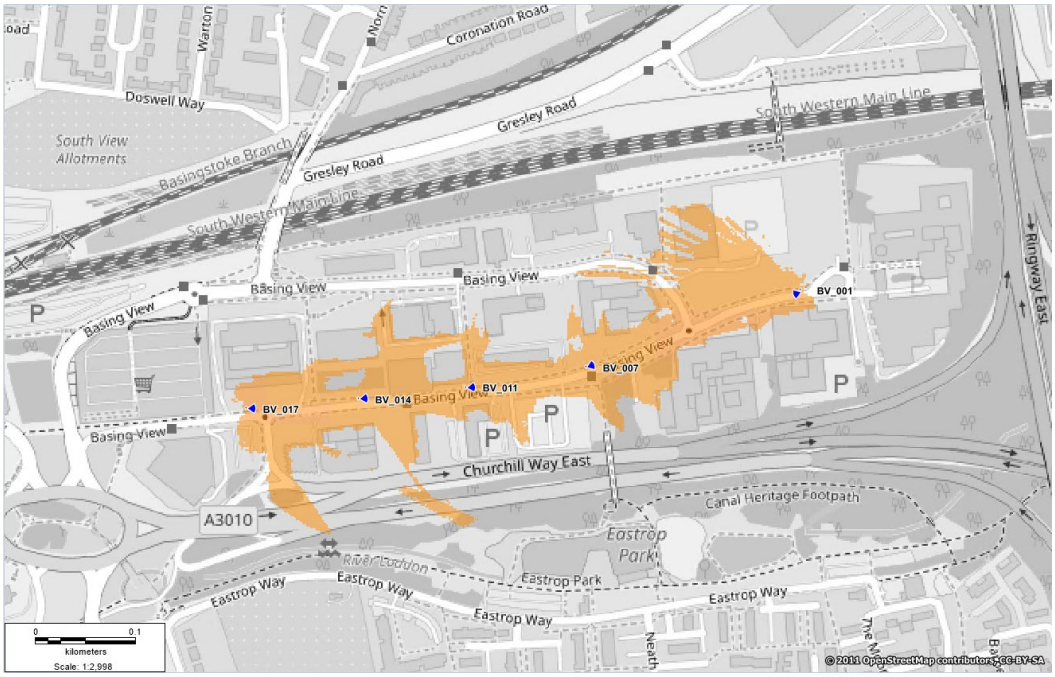

Figure 2 Useable Coverage for 100Mbps DL using Rural Transmit Power at height of 6m using directional antennas in an Urban area

If we had been forced to utilise low power, then the site count would have been c.1.7x and required us to install new passive infrastructure (e.g., street assets) and connectivity, which would have made the solution economically unviable due to the additional costs of deployment and operation.

3.2. Low Throughput Use Cases

There are also instances where easier access to medium power would reduce overall spectrum usage (see also our Question 2 response), notably low throughput use cases across wide areas. Medium power would avoid 'hardware' wastage across multiple locations which are barely utilised, as compared to a single high location providing wider area coverage.

3.3. Maximising Economic Benefit

We note that 'uncontrolled' use of medium power spectrum in urban environments may result in 'exhaustion' of available spectrum sooner and over a wider area; as a result, consideration needs to be given to its allocation to ensure maximisation of economic value.

We note that 'high impact from private network' types of location are often located within urban environments, for example airports, ports, logistics and manufacturing hubs. There is a risk that if these locations are later to adopt private network technology, sometimes due to circumstances beyond their control (e.g., regulatory periods), then they may be unable to access spectrum due to other 'lower value' use cases having already been allocated all available spectrum.

This risk can be mitigated to extent by (i) improvements to the exception process and use of accurate radio propagation data per deployment (ii) creation of 'certified providers' where organisations cooperate to enable new deployments nearby to existing ones, please see our response to Question 7 for further details.

Ofcom should consider how it might balance the requirement for medium power for individual schemes in the context of likely overall demand for high impact use cases within an urban area, given typical requirement for 100 MHz per system.

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?

4.1. Existing Exemptions Process Comments

The current process works in terms of its overall aim of reaching a solution (or otherwise) for complex/non-standard and nearly all urban outdoor deployments. However, it is sequential and highly , ith no option to commence from initial application. As a result, it is timely, costly and impactsthe ultimate customer/network user's confidence that a solution will be reached.

These current process artifacts and features also mean that for a 3rd party/neutral host operator such as Cellnex Uk, this exercise has to occur post procurement outcome/bid award; if a solution could not be found there would be significant abort costs for all parties.

In terms of specifics Cellnex UK notes the following points:

- Currently there is a need to apply normally and then requested to fill in exemption form rather than allowing the applicant to identify it will be an exemption from the start, this wastes time and effort
- No ability to inform Ofcom that a directional antenna is in use which may have a positive impact on the ability for a licence to be granted
- An iterative parameter by parameter approach to finding a solution as opposed to a multi-parameter/multi-disciplinary approach which recognises the complexity but also flexibility available within private network radio frequency design

We note current overall SALF process strengths and put forward suggested improvements to the exception process in our response to Question 7.

4.2. Enabling Automation and Exceptions

Overall Cellnex UK welcomes automation provided it is intelligent/logic driven, combined with greater flexibility of input and able to store additional information.

Cellnex UK does not believe increasing automation and the ability to continue to operate an exceptions process need to be mutually exclusive choices. It should be possible to achieve this if there is a dual track and/or ‘jump off’ points within the standard process.

As noted in our response to Question 2, for applicants like Cellnex UK, if furnished with enough information regarding existing deployments, will know prior to application if they need to go down the exception route. Leaving the ‘standard’ route clear for ‘clean’ applications and hopefully resulting in only a small proportion jumping into the ‘exception route’ mid-flight. This will also open the potential for two improvements which we outline in greater detail in our response to Question 7:

- Use of predictive toolsets
- Creation of ‘certified-providers’ regime

Case Study – Use of Exception Process – Basing View Business Park

Cellnex UK has deployed a government funded private network for Basingstoke council consisting of indoor and outdoor elements to enable the trialling of use cases such as prescription delivery, automated vehicles and robotics.

The indoor element was submitted as one application irrespective of the number of radio locations. Whereas the outdoor solution, even though it was within a contained area, required an application per sector which made the process time consuming, complex and prone to error.

Cellnex UK submitted all outdoor applications together alongside a covering note to limit the potential for misalignment when allocating spectrum. The outdoor element required an 'individual' exception for each of the five locations, despite being part of an overall solution. Interaction was then required to achieve the appropriate compromise between minimising interference and being able to deliver the commercial solution. This resulted in an process of Ofcom proposing a solution, we said this didn't work, Ofcom then proposed another and after multiple iterations we finally achieved a suitable compromise for all parties.

There are a number of improvements that could avoid a repeat of this situation for outdoor urban deployments which will believe will be the dominant type in the next few years, we outline these in our response to Question 7.

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

Cellnex's views on the five key areas are set out below:

5.1. EIRP Limits

Cellnex UK believes the indoor EIRP limits are reasonable and there is no current need for them to be changed.

For outdoor usage in urban areas the current limits mean an exception process will nearly always be required for a solution to be economic and viable, please see our answer to Question 3 and wider commentary throughout this response.

5.2. Terminal Power Limits

Cellnex UK does not currently see this as pressing issue to resolve nor one that is having a disproportionate impact on link budgets.

5.3. Antenna Heigh Limits

Please see our response to Question 2

5.4. Antenna Type Assumptions

The application process should enable applicants to detail where they are not using omnidirectional antennas. This would enable organisations to detail if they are utilising directional antennas so initial submissions are accurate, even if this is limited to a predefined list of directional antenna types.

5.5. Frame Synchronisation

Cellnex UK is not supportive of frame synchronisation becoming required by default, as the current frame structure is downlink biased (i.e., 3:1) due to the main 5G equipment being for MNOs, whereas the majority of Private Networks are uplink biased so this would constrain throughput capability. Resolution of this, via complex radio planning, is likely to result in deployment of more sites/sectors and associated cost, which could make schemes economically unviable.

To date, most vendors we work with do not support frame synchronisation and as a result the systems we have deployed to date (e.g., comprised of a number of vendors) cannot support frame synchronisation end-to-end. If this was implemented across the 3.8 – 4.2 GHz band then there would be significant refit/replacement costs assuming that vendors at this point had made it a default feature.

Before making any changes to frame synchronisation Ofcom should engage with equipment vendors to confirm (i) if any currently support frame synchronisation in their current equipment/software releases, if not then (ii) their confirmed product roadmap and associated date to achieve this.

6. Do you have views on whether newer or emerging technologies can support coexistence between additional users in the band, and if so, how?

Cellnex UK does have any comments to make on this question at this time.

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.

The current licencing process has served the industry well, given relatively limited volumes. However, given the increasing demand forecast in the call for input document, our own rapidly growing pipeline and wider industry forecasts, it is clear that it will need to change significantly and rapidly to meet the needs of the industry. Notably, changes are required to ensure it does not start to block or delay deployment of private networks and in turn enablement of operational business transformation throughout the UK.

In this section we note there are several current process strengths that should be retained, and offer some suggestions of tactical improvements that Ofcom could make. However, Cellnex UK believes the biggest single improvement would be for Ofcom to create a 'certified provider' regime with associated organisation certification, which would reduce the burden on Ofcom and enable these organisations to accurately determine if deployments are viable quickly and early in the commercial process.

7.1. Current Process Strengths

We believe the following are key strengths of the current process for the 3.8 – 4.2 GHz band:

- A straightforward approach for indoor allocation, with a clear application form and process
- The Ofcom 'Exception Team', which has strong levels of relevant expertise, engages positively, is communicative and despite current licencing and toolset constraints is solution orientated
- A clear pricing structure which realises value via annual licence fees but not to the extent of impeding deployment and delivery of associated industrial/economic benefit
- Enduring licences, which are critical for organisations who are making significant, sometimes transformational, investment decisions which will rely on the availability of a private network to support them for a significant number of years and in some cases in excess of a decade

7.2. Tactical Areas for Near Term Improvement

We see the following three areas as key near term improvement opportunities:

a. Outdoor Solution Single Form vs. Multi Form Application

Currently a 'multi-location' outdoor scheme requires submission of individual forms for each location, which is complex, time consuming and administration heavy on the applicant, as well as increasing the risk of errors and/or misallocation across a scheme. Ofcom should seek to switch to a 'scheme' type submission form/document bundle to reduce the burden on applicants and align its internal process to this approach.

b. Ofcom 'Exception Team' Resourcing Levels

As noted above, the current team has many strengths, however, the escalating demand for outdoor private networks in urban areas is likely to place significant strain on this organisation. We believe Ofcom will need to add additional resource to this team in the near term to ensure it meets the needs of industry.

From a process perspective, we note the current approach to reaching a solution via the exception process, is sequential and typically iterative, we believe this could be improved via:

- Ofcom enabling higher quality initial scheme submissions via provision of further information on nearby deployments, see below

- Use of multi-skilled/multi-disciplinary workshops where all individuals and information required are present and able to utilise real time tools to reach an 'in the meeting' decision

Alongside this, we would like to see Ofcom, based on input from industry, define service level targets for the exception process and publish performance against them on a regular basis; as this would enable Ofcom to target improvement activity where it will have the greatest impact.

c. *Investment in a Predictive Toolset*

For outdoor urban deployments there are multiple factors which often need to be adjusted to reach a solution, notably bandwidth, antenna height and orientation and transmit power; this process is currently highly manual and reliant on assumptions.

As a result, the process tends to default to a "make an application/change, answer is not possible, try again" approach with associated iterations and cost rather than "if you did X and Y then you would have a solution". Our experience is that normally multiple parameters need to be manipulated to reach a solution, it is about balancing and compromise rather than a single parameter change solving all issues.

Cellnex UK believes Ofcom needs to focus on developing a toolset which has predictive capability, drawing upon information regarding nearby deployments and an expanded set of standard parameters which can easily be altered independently or collectively. This would reduce the numbers of iterations required to reach a solution, with an associated benefit of reducing the burden on the Ofcom 'Exceptions Team' and associate additional resourcing requirements.

An additional benefit of this approach would be for information regarding nearby deployment to be utilised whilst remaining contained within a 'black box' environment, see our response to Question 2 for further details.

7.3. Creation of 'Certified Provider' Organisations

Currently and as detailed above, when exceptions are required Ofcom has significant involvement in the process. Given the likely increase in need to agree exceptions, Cellnex UK believes this activity could become onerous and resource heavy for Ofcom to operate, and/or timescales for resolution may become elongated and not commensurate with the requirements of industry.

Scale providers of private networks have developed strong radio planning and technical skills and as a result may be best placed to agree on a solution between themselves; on the basis they will end up interacting multiple times in the future so it is in their interest to cooperate (i.e. applicant/existing user roles may be reversed for the next interaction).

Cellnex UK believes that this could be achieved by putting in place a certified provider ('CP') regime where organisation have met certain standards and agree to operate in a certain way, we suggest that:

- CP's would be accredited by Ofcom as having requisite technical capability and tools to undertake analysis, they would also sign up to an additional overarching set of terms and conditions regarding their conduct, as well as additional individual licence conditions – see below
- Standard parameters for modelling would be agreed upfront and uniform across all CPs (e.g., ITU-R 1546 ref. interference parameter/models)
- A data set (see our responses to Questions 2 and 4) of existing deployment information would be available to these CPs for CP and non CP deployments

- The CP requesting a new allocation reviews the details of existing deployments in the vicinity and determines what spectrum and bandwidth they can deploy without causing interference to the existing deployed spectrum (i.e., current Ofcom role)
- If no impact within parameters agreed with Ofcom above then the CP moves to submitting licence application supported by completed analysis and confirmatory statement (i.e., Ofcom does not need to review, just record)
- If there is potential impact and/or interference, then CP initiates discussion with existing licence owner to identify remedial action to enable co-existence and then submits the completed analysis and confirmatory statement (including agreement of existing licence holder) to Ofcom
- If agreement cannot be reached, then there would be a process of 'final arbitration' that Ofcom would oversee and have authority over the outcome to try to enable a solution to be achieved

We envisage that the licences issued to CPs' would contain more onerous terms, with those issued to non-CPs just requiring an obligation to provide information to Ofcom or a CP if requested:

- Licences issued to CPs would put obligations on the CP to resolve any interference issues that arise with other users directly
- As per above they would also need to work with new licence requesters (CP's or Ofcom for non CPs) to support applications via provision of information and/or reasonable adjustments to accommodate new schemes
- Accept greater licence obligations, for example need to resolve any interference issues and coordinate with existing and new licensees without involving Ofcom
- Potentially update Ofcom tools and records on a regular basis, either directly or via form-based submissions

Cellnex UK believes the above would enable the required exceptions for scale private network deployments to be agreed effectively, with Ofcom retaining control of the process, but not suffering the cost of scaling internal resourcing; noting that for this approach to work it still requires improved toolsets and data provision as detailed above in 7.2.c.

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.

Cellnex UK notes the additional bands that Ofcom is proposing to make available under the SALF, our overall view is that these will support and enable new use cases, rather than removing or reducing demand from the 3.8 – 4.2 GHz band for private networks.

8.1. Ability of Current Spectrum to Support Use Cases

Cellnex UK notes that throughout the consultation, Ofcom's comments regarding significant and growing interest in the 3.8 – 4.2 GHz band. As detailed in our response to other questions, we agree with this assessment and, therefore, this raises questions regarding future allocation vs. economic benefit (see our response to Question 3), alongside those regarding the licencing processes ability to cope with higher volumes which is covered in our response to other questions.

Turning to demand, as per our earlier responses, if we can continue to access 100 MHz per transmit sector, we can satisfy our/our customers' requirements via the 3.8 – 4.2 GHz band.

8.2. Relevance of Additional Bands

We note Ofcom's intention to make available additional spectrum in the 2.3 GHz and lower 26 GHz band within the SALF. As a neutral host operator whose infrastructure supports a wide variety of customers, and their associated use cases, Cellnex UK welcomes the release of further spectrum and the positive economic impact this will likely have.

Regarding these specific bands we do not envisage making material use of them for our current private network activity in the near and medium term as:

- The European/global equipment ecosystem that has emerged for private networks in the 3.8 – 4.2 GHz band does not exist for these other bands yet
- The ability to access a 100 MHz channel in 3.8 – 4.2 GHz means we can serve current and foreseen use cases without the need for >100 MHz
- Deployments to date typically have a requirement for 'mobility' over medium distances which would be challenging to achieve with mmWave spectrum (e.g., due to LoS and range performance)
- Majority of deployments to date being in campus environment with outdoor/medium power requirements which would not be possible given the proposed 2.3 GHz restrictions of indoor only.

We believe the above will also be true for other private network providers, and, as a result, release of this additional spectrum is unlikely to reduce the growing demand for 3.8 – 4.2 GHz spectrum.

However, as noted earlier, we could envisage others, who may be passive infrastructure sharing customers of Cellnex UK, utilising the 26 GHz band for fixed and potentially nomadic applications. Examples of which might include, fixed wireless access, mobile site backhaul and transmission of high volumes of data between locations to enable edge/local processing in both urban and rural locations. Given these type of use cases and likely technological developments, Ofcom may need to consider whether to make bandwidth channels of more than 100 MHz available in the 26 GHz band.

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.

Cellnex UK notes the following:

- There is a potential issue with vendor kit being able to utilise/adhere to licence conditions when seeking to use 100 MHz between 3.80 GHz and 3.81 GHz, which is driving us to apply for 3.82 GHz upwards, assuming other users face the same challenge, could result in pressure on spectrum availability

We also note the following two points which are not directly related to spectrum but do relate to equipment and are worthy of awareness/consideration by Ofcom:

- A number of organisations are seeking to deliver a private network and enhance the public network experience via the same system, to date equipment vendors have been slow to obtain type approval in the UK for this type of equipment as compared to other markets, notably the USA
- The main issue with equipment remains interoperability between different vendors in an end to end private network solution, it is claimed between radio/end device/core vendors but rarely works 'out of the box/as planned' for the first deployment of a vendor combination, as a result considerable systems integration costs are being occurred to achieve a toolbox of 'confirmed' configurations that can satisfy all required deployment scenarios

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.

Cellnex UK notes that the 3.8 – 4.2 GHz is being utilised by companies to deploy private networks that will be critical to the operation of scale organisations operation for a long time. The associated investments in plant/machinery and operational transformation, often dwarf the investment in the private network and results in very long overall payback timescales.

As a result, it is crucial that the SALF regulatory regime remains stable, and organisations can be assured of continued spectrum access and associated network operation. For this reason, we do not see developments such as dynamic spectrum access as being suitable or a positive development for the 3.8 – 4.2 GHz band.