

## Ofcom Consultation: Enabling Drone Innovation & Security

### 1.0 Executive Summary

Energy Connect (previously Joint Radio Company) welcomes the opportunity to respond to Ofcom's Enabling Drone Innovation & Security consultation and call for input.

Energy Connect supports the enablement of drone innovation and security while ensuring that the resilience and future development of communications supporting Critical National Infrastructure (CNI) are protected. Our principal concern is the proposed use of 453–462.5 MHz for drone control links.

The 450 MHz band is already an important resource for business radio and telemetry applications supporting the energy sector and other utilities. These systems support operational communications including monitoring and control, maintenance, fault response and emergency restoration activities. Energy Connect considers that the protection of incumbent services and continued availability and flexibility of this spectrum is important to accommodate the current and future communications requirements of the energy sector.

Energy Connect recognises Ofcom's assessment that the availability of 450 MHz spectrum is geographically variable, with greater availability in rural and remote areas. However, we consider that the wider impact of introducing drone operations should be assessed in terms of long-term spectrum availability and flexibility of the band, rather than solely whether individual drone deployments can be coordinated without causing harmful interference to existing users.

In particular, Energy Connect is concerned about the potential cumulative effect of increasing numbers of drone deployments on the availability of spectrum for existing and future business radio users. Due to the higher altitude and mobility of drones, the geographical area over which a drone deployment may constrain other users can be greater than that associated with conventional terrestrial business radio use. The effective spectrum requirement and coordination footprint of drone authorisations should therefore be considered when assessing the longer-term impact of the proposals and the overall efficiency of the spectrum in the band.

This is particularly important given the evolving requirements of the energy sector. As the UK moves towards greater energy autonomy and increased deployment of low-carbon technologies, particularly at the distribution network level, there is likely to be increasing demand for low-frequency spectrum to support communications for monitoring and control. The 450 MHz band therefore has potential future value to the energy sector, subject to the outcome of the Government's consideration of the long-term solution for mission-critical CNI communications.

Energy Connect considers that the proposed three-year licence term is therefore appropriate for any interim introduction of drone use in the 450 MHz band. This provides an opportunity to support innovation and gather operational evidence while avoiding prematurely constraining the longer-term use of the band. It also allows Ofcom to consider future spectrum requirements and the wider

European regulatory environment before making longer-term decisions regarding access to the band.

Energy Connect supports Ofcom's proposed coordinated approach and considers that any longer-term decision should be informed by evidence gathered during the initial authorisation period. This should include the cumulative impact of drone deployments on spectrum availability, the effectiveness and administrative burden of coordination, the ability of incumbent users to obtain or modify assignments, and the evolving requirements of CNI communications.

Energy Connect recognises that dedicated or internationally harmonised spectrum for unmanned aviation may provide opportunities for the future development of drone control links. However, our principal concern is that the introduction of drone services into 450 MHz should not unnecessarily constrain a band which may have significant impact on the continuing and future value to the energy sector and other CNI users.

## 2.0 - Background – Energy Connect

Energy Connect (formerly Joint Radio Company) is a wholly owned joint venture between the UK electricity and gas network operators created to manage the radio spectrum allocations and coordinate planning to support operational, safety and emergency communications.

For more than 60 years we have been working with our members, the electricity and gas companies, as they deploy operational telecommunications infrastructure that enables the safe and secure operation of the energy networks. As UK energy networks become more complex, digitalised and decarbonised, our new name reflects our increasingly important role at the intersection of energy and telecommunications. We are a not-for-profit, member-owned organisation, supporting energy networks in the UK and Ireland. We work alongside our members in energy transmission and distribution to help them deploy the secure, flexible, resilient and future-proof telecom systems needed to monitor and control the UK's rapidly changing energy system.

Communications are a fundamental part of the energy networks; they provide the visibility required for monitoring and control of the equipment, which is essential for the safe and secure running of the energy network as a whole. Low carbon generation is now overtaking traditional coal and gas, this creates increased complexity in the network, as more active participants contribute to the network, but also enables a new level of flexibility. However, the low carbon generation also delivers an increased layer of unpredictability and new challenges managing the power quality of the network. Greater visibility to allow effective monitoring and control is key to the resilient and secure energy provision from generation through to point of consumption. Operational telecommunication enables the monitoring and control which is essential to ensure the resilience, security and stability of the energy network.

Energy Connect manages blocks of VHF and UHF spectrum, including the 450 MHz band, for Private Business Radio applications, telemetry & telecontrol services and network operations. Energy Connect created and manages a national cellular plan for co-ordinating frequency assignments for several large radio networks in the UK. The VHF and UHF frequency allocations managed by Energy Connect support telecommunications networks to keep the electricity and gas industries in touch with their field engineers and remote assets. These networks provide comprehensive geographical coverage to support installation, maintenance, operation and repair of plant in all weather conditions on 24 hour/365 days per year basis.

Energy Connect's Scanning Telemetry Service is used by radio based Supervisory Control and Data Acquisition (SCADA) networks which control and monitor safety critical gas and electricity assets throughout the country. These networks provide resilient and reliable communications at all times to unmanned sites and assets in remote locations to maintain the integrity of the UK's energy

transmission and distribution. Energy Connect also manages microwave fixed link and satellite licences on behalf of UK energy networks.

Fixed links have been utilised for many decades in order to provide backbone transmission capability to support existing, application specific networks such as SCADA, Scanning Telemetry and push to talk voice. Increasingly, as these multiple applications convene in the IP domain, growth in backhaul bandwidth requirements are essential. So too is the number of links required, as connectivity is required to push further and further towards the periphery of the energy networks. In addition, fixed links are used to provide teleprotection services which are circuits designed to enable rapid isolation of the energy networks in the case of a fault which is vital for preventing cascading power outages, protecting equipment and maintaining grid stability.

As the energy networks develop to meet the demand for greater carbon neutral generation, and as demand increases, there will be a requirement for the introduction of more fixed links in order to provide the necessary backhaul and protections circuits necessary to manage these more unpredictable generation sources.

Energy Connect supports the European Utility Telecommunications Council's Radio Spectrum Group and participates in other global utility telecom organisations. Energy Connect participates in European Telecommunications Standards Institute (ETSI) working groups developing new radio standards, and European telecommunications regulatory groups and workshops. Energy Connect works with the Energy Networks Association's is an active member of the Energy Networks Association Strategic Telecoms Task Group and is an acknowledged knowledge source for cyber-security in respect of radio networks.

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### 3.0 Detailed Responses to Questions

**Question 1:** Do you have any comments on our impact assessments as set out in Annex 1? Please specify whether your comments relate to:

- our wider impact assessment;
- our equality impact assessment; or
- our Welsh language impact assessment.

#### **Energy Connect Response**

Confidential? No.

Energy Connect considers that the wider impact assessment would benefit from further consideration of the cumulative and longer-term effect of additional drone use on the ability of existing and future business radio users to access spectrum. In particular, the assessment should consider not only whether existing assignments can be protected from harmful interference, but whether the introduction of additional users could progressively reduce the spectrum available to meet future requirements.

This is particularly relevant to CNI operators. As the UK moves towards energy autonomy, with greater emphasis on low carbon technologies, increasingly introduced at the distribution network, there will be an increasing demand for low frequency spectrum to support the communications for monitoring and control of the energy network. This band has the potential for future use by the energy sector subject to the decision by government of the long-term solution for CNI comms.

The future value of spectrum in this range to the energy sector is not a newly identified requirement. In Ofcom's Strategic Review of UHF Band 1 and Band 2, published in 2017, JRC highlighted the increasing spectrum requirements of utilities, including the need for additional spectrum to support smart grids and the increased communications infrastructure associated with distributed low carbon generation. Ofcom subsequently recognised that the communications requirements of the utilities sector were increasing and were important to CNI.

More recently, Ofcom's 2023 work on potential spectrum bands for utilities identified 450 MHz as one of the candidate bands for future operational communications and noted that the longer-term trends in the use of 450 MHz should be considered, taking account of the requirements of existing and potential future users.

Against this background, Energy Connect considers that spectrum which is technically or geographically available at the time of assessment should not automatically be regarded as surplus to the future requirements of existing CNI users. The 450 MHz band has characteristics that make it

potentially valuable for wide-area operational communications, particularly where resilient coverage is required.

Energy Connect therefore considers that the wider impact assessment should give greater consideration to the broader impact on spectrum availability and operational flexibility, in addition to protection from interference.

Energy Connect also considers that these impacts should be monitored during the proposed three-year authorisation period and explicitly considered as part of Ofcom's subsequent review of the 450 MHz arrangements.

**Question 2:** Do you agree with our assessment of the 450 MHz and 5030-5091 MHz bands for drone control links? Do you agree there is demand for these bands in the UK (please identify any relevant use cases and locations in your response)? Are there any other frequency bands we should consider for control links?

### **Energy Connect Response**

Confidential? No.

Energy Connect supports Ofcom's ambition of enabling innovation through the use of unmanned aircraft systems (UAS). The UK energy sector is expected to benefit from increased use of drones for inspection, surveying, emergency response and asset management, particularly for Beyond Visual Line of Sight (BVLOS) operations across geographically dispersed infrastructure and we are aware of trials within the utility sector of drone inspection of assets. We do therefore recognise that there is a growing demand for resilient and reliable spectrum to support these applications.

Energy Connect does not however agree with Ofcom's overall assessment of the suitability of the proposed 450 MHz spectrum for drone control links. Whilst the consultation identifies opportunities for spectrum sharing within the 453–462.5 MHz business radio allocation, we believe it understates the strategic importance of this spectrum to operators of the UK's CNI in light of continuing use of the band to support expansion of monitoring and control networks for the energy sector.

The 453–462.5 MHz band continues to support approximately 865 operational business radio systems across the electricity, gas, water and other utility sectors. These systems provide monitoring and control of assets, communications for operational staff, engineering teams, control room functions, fault response and restoration activities, many of which are essential to maintaining and restoring critical services. The resilience and continued availability of this spectrum and the potential for additional BR services to be deployed is therefore of considerable importance.

The potential future importance of spectrum below 470 MHz to the energy sector has also been recognised for many years. In Ofcom's 2017 Strategic Review of UHF Band 1 and Band 2, JRC highlighted increasing utility requirements for spectrum to support smart grids, including the additional communications infrastructure required for monitoring and control of increasing distributed low carbon generation.

This remains relevant to the current assessment. In its 2023 Call for Input on potential spectrum bands for utilities, Ofcom identified 450 MHz as a potential candidate for future utility operational communications and noted that it would further consider longer-term trends relating to the use of the band, taking account of the requirements of existing and potential future users.

Energy Connect therefore considers that the availability of spectrum for drone use should be assessed not only against current assignments, but also against the potential future requirements of existing CNI users.

Further, Energy Connect has analysed current Ofcom licensing data using its internally developed spectrum visualisation tool. The accompanying heatmap shown in *Figure 1* below demonstrates the percentage occupation of the 453-462.5 MHz range per 50km grid square (as per the Wireless Telegraphy Register).

This analysis broadly aligns with Ofcom's assessment that spectrum availability is greater in Scotland, Wales and Northern Ireland, particularly in rural and remote areas. However, Energy Connect recognises that percentage occupation does not in itself provide a direct measure of the number of viable channels available for use. In particular, the availability of suitable 12.5 kHz duplex pairs depends on the frequency distribution of existing assignments, rather than simply the proportion of the overall band that is unoccupied. Ofcom's Figure 4.2 provides a more direct indication of the number of simplex channels and duplex pairs potentially available within each 50 km grid square.

Energy Connect therefore presents the heatmap as an indication of the existing distribution and utilisation of the band, rather than as a measure of the spectrum that could necessarily be made available for additional users. This distinction is important when considering the future availability of spectrum for the energy sector.

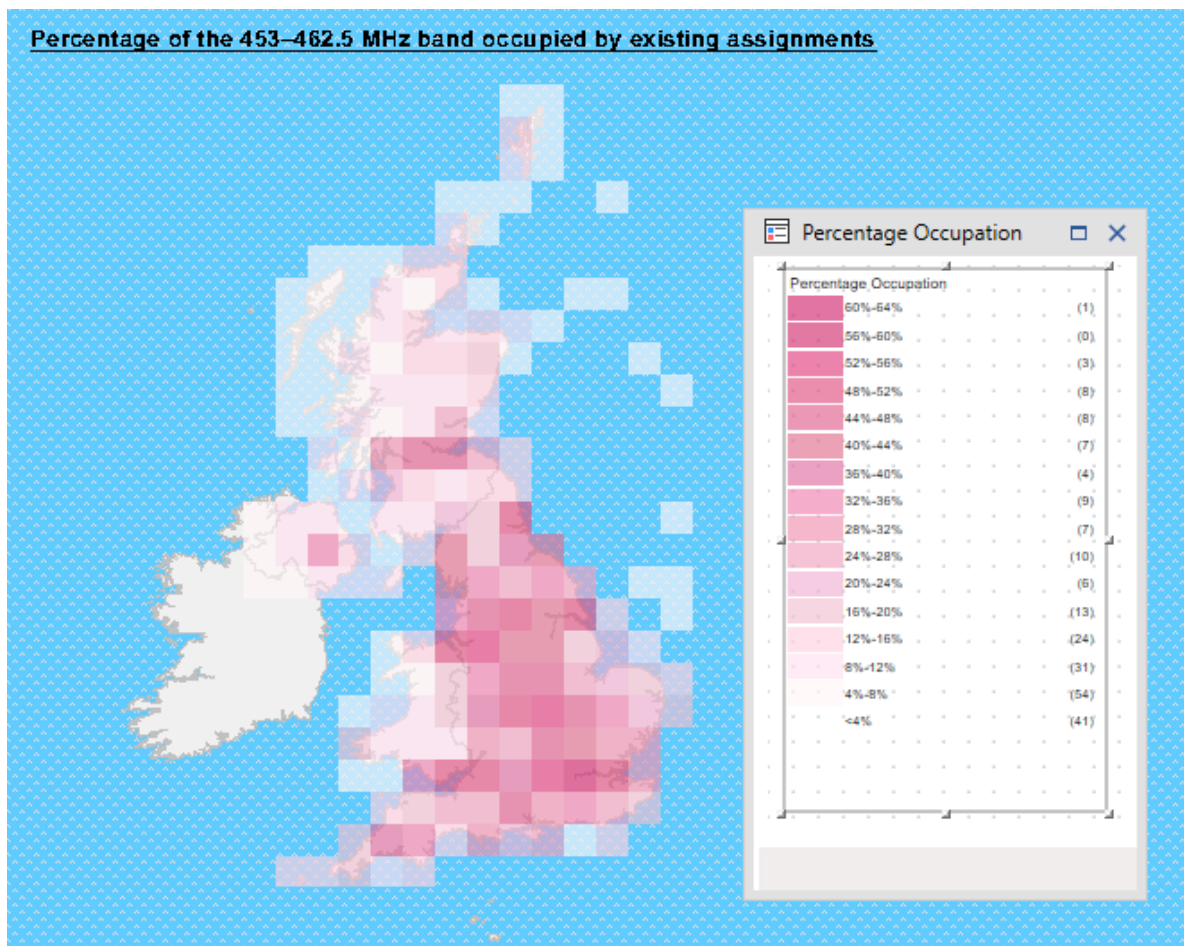


*Figure 1: Heatmap showing percentage occupation of the 453-462.5 MHz band per 50km grid square across the UK. Dark pink represents high percentage occupation.*

Ofcom identifies 418 12.5 kHz channels as potentially available for coordinated drone use. Energy Connect recognises that these channels are among those currently less constrained by existing business radio assignments. However, this apparent availability should not necessarily be regarded as surplus capacity, particularly given the potential future requirements of the energy sector.

As the UK moves towards greater energy autonomy, with increasing deployment of low-carbon technologies, particularly at the distribution network level, there is likely to be increasing demand for low-frequency spectrum to support communications for monitoring and control. The 450 MHz band therefore has potential future value to the energy sector, subject to the outcome of the Government's consideration of the long-term solution for CNI communications.

Energy Connect considers that spectrum specifically intended for unmanned aviation, such as the proposed 5030–5091 MHz allocation, represents a more appropriate long-term solution.

Internationally harmonised spectrum designed for aviation applications is likely to provide a more sustainable basis for future drone operations whilst minimising pressure on heavily utilised business radio spectrum that continues to underpin essential operational communications.

Energy Connect therefore supports the continued development of dedicated or internationally harmonised spectrum solutions for drone control links. At this stage, we do not propose alternative frequency bands but encourage Ofcom to continue investigating spectrum that can meet future UAS requirements without increasing pressure on existing business radio allocations relied upon by CNI operators.

**Question 3:** Do you have any comments on our proposed approach to coordinating drones with other users of the 450 MHz band? In your response, please indicate whether it relates to co-channel or adjacent channel use, and provide evidence for any coexistence issues raised.

**Energy Connect Response**

Confidential? No.

Energy Connect agrees that any use of the 450 MHz band for drone control links must be subject to coordination with incumbent users. However, we consider that the consultation is yet to demonstrate how the practical challenges of coordinating airborne systems within this heavily utilised business radio band are to be overcome.

Energy Connect is concerned that the proposed coordination methodology has largely been developed from the perspective of conventional terrestrial business radio systems. Drone control links differ fundamentally in that they are both highly mobile and operate at variable altitude and as a result, their radio horizon and interference potential change continuously throughout a flight. This creates a coordination challenge that is significantly more complex than coordinating fixed sites or ground-based mobile systems and raises questions regarding the practicality and scalability of the proposed coordination process as drone numbers increase.

Energy Connect considers that this difference should be taken into account when assessing the cumulative impact of increasing numbers of drone deployments on spectrum availability.

Energy Connect also considers that the cumulative impact of multiple drone operators has not been fully explored. Whilst an individual deployment may be capable of being coordinated successfully, increasing numbers of drone operations within the same geographical area may progressively reduce the availability of channels for incumbent users and increase the administrative burden associated with frequency coordination.

The consultation would also benefit from further explanation of the assumptions regarding spectrum utilisation. For example, it is unclear how many simultaneous drone operations are

expected to share a single assigned channel within a coordination area, or how the availability of that channel to other business radio users is expected to change as additional drone licences are authorised.

Regarding adjacent channel use, Energy Connect welcomes Ofcom's recognition that additional separation may be required to protect non-business radio users. However, the proposed guard bands inevitably reduce the amount of usable spectrum available within an already constrained allocation. The practical effect is that incumbent users may experience reduced flexibility when expanding existing systems or deploying new operational networks, particularly in areas where channel availability is already limited.

Further, the proposed drone channels are distributed across multiple sections of the 453–462.5 MHz band. Where guard bands are required, allocating isolated channels across several frequency blocks may reduce overall spectral efficiency compared with assigning a smaller contiguous block. We ask Ofcom to demonstrate that the proposed channel plan minimises unnecessary sterilisation of neighbouring business radio spectrum.

Energy Connect therefore encourages Ofcom to adopt a cautious approach to authorising drone operations within the 450 MHz band until sufficient operational evidence exists to demonstrate that widespread airborne use can coexist with incumbent business radio services without reducing spectrum availability or operational resilience for CNI users. This spectrum is a valuable resource for the development of existing radio systems supporting the safe operation of the energy network but also offers a potential growth band for a dedicated mission critical communications network subject to the ongoing government decision process.

**Question 4:** Do you have any comments on our proposed 450 MHz drone authorisation approach? Please provide any specific views (including technical justification where relevant) on:

- the proposed technical conditions, including operating height AGL, power, channel bandwidth, designated service area, and number of base stations;
- the proposed non-technical conditions, including licence fees and term, frequency flexibility and complying with CAA rules and radio equipment standards; and
- reviewing our initial authorisation approach.

### Energy Connect Response

Confidential? No.

Energy Connect recognises Ofcom's intention to establish an interim authorisation framework that enables innovation whilst protecting incumbent users. We welcome the decision to adopt a coordinated licensing approach limited to a 3 year term rather than a licence-exempt or light

licensing regime, as this reflects the need for careful spectrum management within a heavily utilised business radio allocation.

With respect to the proposed technical conditions, Energy Connect broadly supports the principle of limiting operating parameters to minimise the potential for interference. In particular, restricting channel bandwidths to 12.5 kHz and requiring individual frequency coordination are sensible measures that align with the characteristics of existing business radio use.

However, Energy Connect considers that the proposed technical conditions should continue to prioritise the protection and future expansion needs of incumbent users above maximising spectrum access for new applications. The proposed operating height, transmit power and service area should remain subject to a conservative coordination methodology, recognising that airborne systems present different propagation characteristics to conventional terrestrial business radio users. Small changes to these technical parameters could significantly increase the coordination area required to protect existing assignments and reduce spectrum availability for incumbent users.

Energy Connect also supports retaining the existing Area Defined licensing model based on 50 km grid squares, as this is well understood by spectrum users and aligns with current business radio licensing arrangements. However, the designation of service areas should not imply guaranteed long-term access to spectrum where coordination constraints become more challenging as drone deployment increases.

The consultation proposes a flexible approach whereby licensees may be assigned different frequencies within the authorised spectrum block. Energy Connect supports this principle, provided that sufficient flexibility is maintained for incumbent business radio users. Frequency flexibility should not result in existing licensees experiencing increased difficulty in modifying, expanding or renewing operational networks supporting CNI.

Energy Connect considers the proposed three-year licence term to be appropriate for an interim authorisation. This provides an opportunity to support innovation and gather operational evidence without prematurely establishing long-term use of the band before the future requirements of CNI communications and the wider European regulatory direction of the band are clearer. The limited licence term is therefore important in ensuring that interim access does not unnecessarily constrain future options for the band.

As part of any review, Energy Connect recommends that Ofcom assess not only interference reports but also the practical effectiveness of the coordination process. This should include metrics such as coordination timescales, the number of applications requiring modification, the cumulative impact on channel availability, the effect of guard bands on spectrum utilisation, and whether

incumbent business radio users have experienced increasing difficulty obtaining new assignments or modifying existing licences.

Energy Connect strongly supports Ofcom's proposal to review the authorisation approach after the initial licensing period. We recommend that this review is informed by evidence gathered during the operation of the licensing regime, including spectrum utilisation, coordination outcomes, reported interference incidents, the administrative burden associated with coordination, and the impact on future business radio licensing requests. Any decision to extend or expand access to the 450 MHz band should not only consider the direction of travel of any government decision around the future of mission-critical comms for utilities but also be supported by demonstrable evidence that incumbent users, particularly those supporting CNI, have not experienced any reduction in spectrum availability, operational resilience or ability to develop future communications networks.

Overall, Energy Connect considers that a coordinated, time-limited authorisation is preferable to any permanent or less restrictive access arrangement. Should Ofcom proceed with the proposed licensing framework, the continued protection of incumbent business radio users should remain the primary objective of the coordination process.

**Question 5:** Do you have any comments on our proposed 5030-5091 MHz drone authorisation approach? Please provide any specific views (including technical justification where relevant) on:

- the portion of the band proposed for early release (5040-5060 MHz);
- the proposed technical parameters and approach to coordinating drones and/or protecting other users of the band; and
- the proposal to phase out licences once there is global harmonisation, the required transition period and sunset clause.

### **Energy Connect Response**

Confidential? No.

Energy Connect is broadly supportive of Ofcom's proposed approach to enabling drone control links within the 5030–5091 MHz band. Unlike the proposed use of the 453–462.5 MHz business radio allocation, this spectrum has greater potential to provide a sustainable long-term solution for unmanned aviation whilst minimising the impact on incumbent users of business radio spectrum supporting CNI

Energy Connect supports Ofcom's proposal to initially make the 5040–5060 MHz portion of the band available whilst international standards continue to develop. A phased approach provides an opportunity to gain operational experience, encourage equipment availability and support innovation without committing prematurely to a permanent national implementation before global harmonisation is achieved.

Energy Connect agrees that appropriate technical conditions and coordination mechanisms will be essential to protect existing users of the band. Whilst Energy Connect does not represent incumbent users within the 5 GHz aeronautical allocation, we support Ofcom's principle that new drone services should only be introduced where compatibility with existing authorised services can be demonstrated through robust technical analysis and coordination.

Energy Connect also supports Ofcom's proposal that licences should ultimately transition towards internationally harmonised arrangements once these become established. Harmonised spectrum offers significant benefits through improved equipment availability, greater interoperability and a clearer long-term regulatory framework. It also reduces the need to rely on spectrum bands that already support established operational services in other sectors.

Should a future transition be required, Energy Connect encourages Ofcom to provide sufficient notice and an appropriate migration period to allow equipment manufacturers, service providers and operators to plan for any changes. A clear transition strategy will help avoid unnecessary disruption to early adopters whilst supporting the long-term objective of international harmonisation.

Energy Connect considers that continued development of spectrum specifically intended for unmanned aviation is likely to reduce future pressure on heavily utilised business radio allocations, allowing each spectrum band to evolve in accordance with its primary purpose.

Overall, Energy Connect considers that the 5030–5091 MHz band represents a more appropriate long-term home for drone command and control than further expansion into heavily utilised business radio spectrum. We therefore support Ofcom's continued work to develop this band as the primary spectrum solution for future BVLOS and other advanced drone operations.

**Question 6:** Do you have comments on our proposal to create a new drone detection radar licence for the 24 GHz band, including the proposed technical and non-technical conditions, the proposed draft licence in Annex 12, and our coexistence analysis in Annex 6? Please provide evidence for any issues raised.

### **Energy Connect Response**

Confidential? No.

Energy Connect supports the proposed drone detection radar licence for the 24 GHz band and the associated technical and non-technical conditions. Drone detection will be of interest to the utility sector to protect existing and future assets.

**Question 7:** Do you have comments on our proposal to create a new drone detection radar licence for the 16 GHz band on a case-by-case basis, including the proposed technical and non-technical conditions and proposed draft licence in Annex 12? Please provide evidence for any issues raised.

**Energy Connect Response**

Confidential? No.

Energy Connect supports the proposed drone detection radar licence for the 16 GHz band and the associated technical and non-technical conditions. Drone detection will be of interest to the utility sector to protect existing and future assets.

**Question 8:** Have you identified any other frequency bands we should consider for drone control links in the longer term?

**Energy Connect Response**

Confidential? No.

Energy Connect does not propose an alternative frequency band for drone control links at this stage. However, we encourage Ofcom to continue considering internationally harmonised spectrum solutions for unmanned aviation and to take account of the wider European regulatory direction when considering any longer-term changes to the 450 MHz band.

**Question 9:** Do you have any comments related to the existing satellite frequencies available for drone control links?

**Energy Connect Response**

Confidential? No.

Energy Connect has no specific comments on the existing satellite spectrum arrangements for drone control links. Satellite connectivity is likely to complement terrestrial solutions in certain operating environments, particularly where resilient long-range communications are required.

**Question 10:** What are your needs and priorities for accessing spectrum for drone safety? Do you have interest in future use of 15 GHz and/or 76 GHz, or other specific frequencies and bands for similar drone safety use?

**Energy Connect Response**

Confidential? No.

Energy Connect has an interest in the future use of 15 GHz for drone safety applications, as the band is also used by the energy sector for fixed links supporting operational communications.

Energy Connect therefore considers that any introduction of new drone safety applications in the 15 GHz band should take full account of existing and future fixed link requirements. Fixed links provide important backhaul and teleprotection services for energy networks and increasing deployment of low-carbon generation and greater network complexity are likely to increase demand for such infrastructure.

Energy Connect supports Ofcom's continued evidence-based approach to assessing compatibility with incumbent services before introducing new spectrum authorisations. Any future proposals should ensure that the requirements of existing and future critical fixed link users are appropriately protected.

**Question 11:** Do you have any interest in ground based UAT to complement the aerial component in 978 MHz licences?

**Energy Connect Response**

Confidential? No.

Energy Connect has no current interest in the use of ground-based UAT to complement the aerial component of 978 MHz licences and has no specific comments on this proposal.

**Question 12:** Are you interested in or do you have any plans to trial the use of ISAC for drone detection purposes?

**Energy Connect Response**

Confidential? No.

Energy Connect has no current plans to trial Integrated Sensing and Communications (ISAC) technologies for drone detection purposes and therefore has no specific comments on this proposal other than that it may be of interest to our members.

**Question 13:** Do you have any other comments on this consultation document?

**Energy Connect Response**

Confidential? No.

No comment.