



JRC Response to the Call for Input on the Strategic review of satellite and space science use of spectrum

KEY POINTS

- JRC welcomes the opportunity to respond to this consultation.
- JRC highlights that the importance of a satellite system is not necessarily proportional to the amount of data that it communicates. For example, the whole of the UK's gas and transmission network requires less than a kilobit per second of data back-hauled primarily by satellite to monitor and control the entire high and medium pressure network.
- Satellite communications are playing an increasingly important role in utility operations to complement terrestrial communications in remote areas where terrestrial communications are disproportionately expensive and to enhance telecommunications resilience for the benefit of all UK citizens and specifically electricity and gas consumers.
- Utilities are customers of a number of important satellite services for weather forecasting, synchronisation timing, location finding, etc.
- JRC notes that Ofcom is 'seeking to make more and better information available to stakeholders on spectrum use.' JRC is concerned that Ofcom does not publish information that could jeopardise the security of the UK's critical national infrastructure (CNI), and seeks assurance from Ofcom that this data will be protected.

Consultation Questions – All and Satellite Respondents

Question 2: Do you have any comments on our broad overview of the satellite sector set out in this section?

In particular, do you have comments on the completeness of the list of applications, their definitions and their use of the relevant ITU radiocommunications service(s)?

JRC notes that Table 1 indicates that 'M2M applications' use the Mobile Satellite Service (MSS) whereas Utility Operations in the main use spectrum allocated to the Fixed Satellite Service (FSS). Utilities have been designing, installing, operating and maintaining resilient machine to machine (RM2M) systems for over 50 years and have been incorporating satellite communications into their portfolio of service options for more than 10 years.

Question 4: Do you have any comments on our representation of the value chain for the satellite sector? How do you think industry revenues are broken down between players at different positions in the chain?

JRC highlights that the stable supply of electricity is an essential resource for the delivery of almost all goods and / or services to UK citizens, consumers, and their suppliers within the satellite sector value chain. Likewise, approximately two-thirds of the UK's energy is provided by the gas network within which satellite telemetry and telecontrol play a major part.

The utilities are also important customers of weather forecasting data which depends heavily on data provided by remote sensing by satellite. This data informs weather predictions which are an essential element in forecasting energy demands for the day-ahead, and increasingly the forecast output of renewable resources such as wind power and solar energy.

Utilities are intensive users of the positioning services and subsidiary timing services. Utilities use the geographic positioning services not only for navigation, but also location fixing for both above ground and underground infrastructure. Timing services derived from the Global Positioning System (GPS) are used as simple sources of synchronisation for network timing, although this is back-up by independent precision timing sources as GPS is not viewed as resilient or secure.

Question 5: What is the extent of your organisations' role(s) in the value chain? Which satellite applications (as summarised in Table 1 in section 3) does your organisation:

- **use;**
- **provide: or**
- **help to deliver?**

Please list all applications that apply and your role in each in your response.

JRC advises that Utility Operations use FSS systems for the management and control of resilient machine to machine (RM2M) telemetry and telecontrol systems. The largest UK system involves control of electricity Utility Operations in South East England. (The potential for incoming harmful interference from UHF radio systems operating in mainland Europe is a factor in choosing satellite systems in this area rather than the more typical terrestrial 450 to 470 MHz telemetry systems.)

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Question 6: For each of the satellite applications you use, provide or help deliver (as identified in Question 5), and taking into account your role in the value chain, where applicable please provide:

- **the specific spectrum frequency ranges used for each application, distinguishing between the frequencies used for service provision, for the feeder / backhaul links and for TT&C ;**
- **the coverage area for services links; or, in the case of TT&C and feeder / backhaul links, the location of the gateway station(s);**
- **the estimated number of users (e.g. MSS terminals, DTH subscribers, FSS earth stations);**
- **an estimate of the average use by end user (for those applications for which the demand for spectrum is driven by end user traffic); and**
- **for applications for which the demand for spectrum is driven by other factors, please state what the factor is and the scale of the factor (e.g. for DTH TV the number of TV channels broadcast by format).**

Please provide your response with respect to the UK, the rest of Europe, and other parts of the world where this may be relevant to UK use.

JRC highlights that the various UK Utility Operations systems form part of the critical national infrastructure are therefore operated and managed wholly within the UK's legal jurisdiction.

Utility telemetry and telecontrol operations at present operate entirely within the Fixed Satellite Service spectrum, although a limited amount of emergency voice capability is provide by the Mobile Satellite Service.

In terms of detailed data on frequency bands, numbers of terminals and service areas, in respect of the gas and electricity sector, JRC recommends that Ofcom approaches the Centre for the Protection of National Infrastructure (CPNI).

Question 7: For each of the satellite applications you provide, please could indicate how UK consumers and citizens benefit from their use?

Where possible please also provide an indication of the scale of the benefits (either qualitatively or quantitatively).

JRC highlights that the stable supply of electricity, as may be controlled by satellite systems, is an essential resource for the delivery of almost all goods and / or services to UK citizens and consumers. It could therefore be considered that the benefit of the stable supply of energy may be the sum of the benefits of the users that it supplies.

One of the key findings of a Report for the Council for Science and Technology in November 2014 entitled "Counting the cost: the economic and social costs of electricity shortfalls in the UK" concluded:

"Any significant interruption to electricity supply in the UK will have severe economic consequences. The UK is becoming rapidly more dependent on electricity, and networks, processes and value chains are becoming increasingly complex and interdependent. These trends are magnified by increasing reliance on electronic communications technologies and the internet. The potential economic and social impacts of electricity shortfalls will, therefore, only continue to increase in the future. However, the pace of change means that our understanding of the potential magnitude of these impacts is constrained by limited knowledge about the knock-on consequences that could occur across the economy and society. Evidence from previous economic modelling and from international case studies suggests that the economic impact of a severe and widespread outage (ie affecting the vast majority of the UK, including major cities for at least 12 hours during a weekday) would potentially cost billions of pounds; however, estimates are complicated by high

uncertainty and lack of reliable and comparable data. Finally, it is worth noting that future shifts in the energy system may further increase the UK's dependence on electricity, particularly if heating and transport become more electrified. This could heighten the detrimental impacts of electricity outages in the future.”

A Report by JRC for the US and European Utility Telecommunications Councils (UTC and EUTC) on the Socio-economic value of spectrum in providing utility services to support their operations contained two key findings of a similar nature derived from studies in the USA:

- The annual cost of power disturbances to the US economy ranges between \$119 and \$188 billion per year. [Electric Power Research Institute 2011]
- The societal cost of a massive blackout is in the order of \$10 billion per event. [North American Reliability Corporation Report]

JRC also highlights that approximately two-thirds of the UK's energy requirement is delivered by gas. The stable supply of gas is an essential resource for the delivery of cooking and heating facilities to UK citizens and consumers. It is also an essential resource as the fuel for gas fired electricity power stations.

Question 8: From your perspective, what high level trends will affect the satellite sector in the coming years?

JRC identifies the following issues which it believes may become significant:

- The general growth in demand for radio spectrum for all services.
- The pressure on orbit space, especially geosynchronous orbit as nations with large land masses develop and contend for their own satellite orbit slots.
- The vulnerability of satellite systems to interference, especially from those with malicious intent, possibly with tacit support from rogue nation-states.

Question 9: For each of the satellite applications you use, provide or help deliver what do you see as the a) current demand trends; and b) underlying current and likely future drivers of demand for the satellite application(s) your organisation uses or provides?

Please include in your response for both a) and b) above:

- **the scale and future impact of the trends/drivers on demand;**
- **any variations in the type and scale of trends/drivers by geography (i.e. in the UK, the rest of Europe, and other parts of the world where this may be relevant to UK use) and why;**
- **whether future demand is expected to be temporary or intermittent, and the reasons for this.**

In your response, please provide any evidence which supports your position on the drivers of demand (e.g. forecasts, studies and statistics).

JRC suggests that the need for Smart Grids, and the on-going loss of spectrum to public mobile networks, will lead to an increasing demand on, inter alia, satellite link spectrum because these services may be used as part of a portfolio of services to supply the resilient communications required by the gas and electricity utilities.

Question 10: Taking into account the drivers you have identified in your response to Question 9 above, what (if any) challenges is your organisation concerned about in meeting potential future demand?

Please provide the information by application and band, along with any supporting evidence, if available.

JRC is concerned that policy makers and regulators retain a vision of the vast array of services supported by the radio spectrum – including satellite and space services - and avoid undue concentration on a limited range of services which attract the most publicity.

Question 11: Do you have any comments on the list of potential mitigations we have identified? What likely impact would each of the mitigations have on spectrum demand? E.g. what order of magnitude increase in frequency re-use might be achieved? To what extent do you believe that these mitigations apply only to certain applications?

JRC suggests that all of the suggested mitigations may increase spectrum efficiency.

JRC suggests that spectrum value should include its socio-economic value and not just the revenue raised by an auction.

Background

JRC Ltd is a wholly owned joint venture between the UK electricity and gas industries specifically created to manage the radio spectrum allocations for these industries used to support operational, safety and emergency communications. JRC also represents gas and electricity interests to government on radio issues.

JRC and the utilities manage a significant number of satellite links to critical nation infrastructure and is keen for their protection and the on-going access to these bands.

JRC also manages blocks of VHF and UHF spectrum for Private Business Radio applications, telemetry & tele-control services and network operations. JRC created and manages a national cellular plan for co-ordinating frequency assignments for a number of large radio networks in the UK.

The VHF and UHF frequency allocations managed by JRC support telecommunications networks to keep the electricity and gas industries in touch with their network assets and field engineers throughout the country. The networks provide comprehensive geographical coverage to support the operation, installation, maintenance and repair of plant in all weather conditions on a 24 hour/365 days per year basis.

JRC's Scanning Telemetry Service is used by radio-based System Control and Data Acquisition (SCADA) networks, which control and monitor safety critical gas and electricity industry plant and equipment throughout the country. These networks provide resilient and reliable communications at all times to unmanned sites and plant in remote locations to maintain the integrity of the UK's energy generation, transmission and distribution.

JRC works with the Energy Networks Association's Future Energy Networks Groups assessing the ICT implications of Smart Networks, Smart Grids and Smart Meters.