Response from Joint Radio Company (JRC)

4. QUESTIONS

The questions that the Commission has identified to assist respondents in focusing their submissions to this call for evidence are set out below:

Cross-cutting issues:

1. What are the highest value infrastructure investments that would support long-term sustainable growth in your city or region?

Note: this can apply to national, regional or local infrastructure, where you consider it would best support sustainable growth in your city or region in practice. Considerations of "highest value" should include benefits and costs, as far as possible taking a comprehensive view of both.

JRC highlights that almost every product and service offered to the UK's 68 million citizens, consumers, and businesses rely directly or indirectly on the stable provision of electricity and / or gas[1] by the UK's Critical National Infrastructure[2] Utility Operations.

Highest value: JRC therefore suggests that the value of the electricity Smart Grid will be at least equal to the sum of values that are created by its use (+VAT).

Benefits: the increasing number of distributed generation sources, e.g. wind turbines, being connected to the current electricity grid is placing an increasing strain on maintaining the stability of the network. The benefit of investing in the rolling out of the electricity smart grid will be that the likelihood of significant power outages will be reduced, and the time to restore the network when faults arise or it suffers damage is greatly reduced.

4. What is the maximum potential for demand management, recognising behavioural constraints and rebound effects?

Note: "demand management" includes smart pricing, energy efficiency, water efficiency and leakage reduction. "Rebound effects" refer to the tendency for demand to increase when measures aimed at reducing or spreading demand also lead to lower prices or reduced congestion, undoing at least some of any demand reduction. For example, if smart meters reduce the cost of electricity in off-peak periods, this could lead to greater energy consumption overall, where a large number of individuals or firms take advantage of these lower prices by increasing their total usage.

JRC suggests that smart electricity metering as implemented in Great Britain may not be as useful for the control of the electricity smart grid as may be assumed. This is because the architecture of smart metering in GB may not be able to deliver adequate data on a timescale appropriate for real-time control of the electricity network. The electricity smart grid is already expected to monitor local area low voltage, 240 / 400 volts, sub-stations and alert the associated control centre

[1] Gas is used to generate typically 50% of the UK's electricity (Source: Grid Carbon)

[2] http://www.cpni.gov.uk/documents/publications/undated_pubs/1001002-guide_to_telecomms_resilience_v4.pdf

immediately if the power to or from it were to be lost. There is therefore little value seen in receiving subsequent last-gasp power loss alerts from wide scale outages when the fault is already known and being managed. (Ideally, the smart grid will recognise a power fault in an area and automatically re-route power from an adjacent area in a few seconds, but definitely within the target timeframe of 3 minutes) The main benefit from smart meters in the GB scenario is to identify interruptions to small numbers of consumers which is not picked up by substation level alarms, and to confirm re-connection of all consumers following a fault where sometimes a second fault on a network is masked by the first.

9. How can we most effectively ensure that our infrastructure system is resilient to the risks arising from increasing interdependence across sectors?
Note: this includes resilience against external risks and/or problems that arise in one or more parts of the system.

Resilience requirements necessitate that existing electricity and gas grids are controlled by private resilient SCADA (supervision, control, and data acquisition) networks. These SCADA networks are increasingly being referred to as private resilient machine to machine (RM2M) networks (and occasionally as private resilient Wireless Multi-Point / WiMP networks). There is a risk that these private RM2M networks could be confused with the generic / sales term of machine to machine (M2M). This could lead to the incorrect belief that public mobile M2M networks will be suitable for RM2M systems.

It should be noted that public mobile systems have been operating, and incrementally upgrading, since the mid 1980's. Despite these on-going improvements (primarily focussed on improving the public's requirement for broadband data), for various technical and operational reasons, the use of public mobile networks remains ruled out for controlling electricity grids. (Other nations including Germany, The Netherlands, and China have already come to the same conclusion and are now deploying dedicated 'Utility Grade' wireless systems to support smart grid functionality).

JRC further highlights that the term IoT refers to the Internet of Things (a different technology to M2M). Whilst this technology could be used for private RM2M networks, the roll-out of IoT systems for public use will not be suitable for electricity smart grids.

Digital communications:

17. What are the highest value infrastructure investments to secure digital connectivity across the country (taking into consideration the inherent uncertainty in predicting long-term technology trends)?
When would decisions need to be made?

JRC suggests that the highest value infrastructure investment will be the eventual roll-out of the electricity Smart Grid. This is because electricity will be required at every point of the digital communications fixed infrastructure.

JRC further suggests that the **highest value infrastructure investment** will be the allocation of suitable resources to enable the roll-out of the electricity Smart Grid. The scarce resource that is most eagerly sought is access to the private radio spectrum held by Ofcom.

It should be noted that, whilst the UK's public mobile phone companies will soon have been allocated ~840 MHz of spectrum by Ofcom, the UK's critical national infrastructure utility operations have only been allocated 2 MHz of radio spectrum (actually, 2 x 1 MHz. Used for separate transmit and receive channels). This very small allocation needs to be increased to 2 x 3 MHz of spectrum in the 400 MHz band (this band continues to be preferred because the radio transmission infrastructure is either in place already or can be added with relatively low cost). There is also a requirement for 10 MHz of spectrum in the 1350/1400 MHz band, and 2 MHz of spectrum in the VHF band. (These allocations of spectrum will enable, inter alia, the most appropriate resilient private SCADA / RM2M control systems to be rolled out. As now, these systems will be long-term technology solutions rather than the perceived ever-changing public mobile technologies.)

As a priority, a speedy UK decision to allocate 2 x 3 MHz (6 MHz) of useable spectrum within the 400 MHz Band (380 to 470 MHz) needs to be made so that the Smart Grid(s) may be planned with a certainty of gaining the necessary access to suitable spectrum.

For information, perhaps surprisingly, the existing resilient SCADA / RM2M systems typically use 12.5 kHz narrow band channels rather than the MHz-wide broadband channels necessary for public mobile systems. This is possible because the typical SCADA data rates are only 9.6 kbit/s to the remote electricity sub-stations, etc. It is, however, expected that Smart Grids will require an increase in data rates, and channel widths, from 9.6 kbit/s in 12.5 kHz to 64 kbit/s in 25 kHz narrow band channels. Unfortunately, there is currently no available spectrum in which to roll-out these systems. An independent study by the European Utilities Telecom Council (EUTC) identifies that 2 x 3 MHz of 400 MHz Band (380 to 470 MHz) spectrum will be required.

18. Is the existing digital communications regime going to deliver what is needed, when it is needed, in the areas that require it, if digital connectivity is becoming a utility? If not, how can we facilitate this?
Note: the existing "regime" refers to the current market, competition and planning frameworks. "Digital communications" includes both fixed and mobile connectivity.

JRC highlights that the proposed digital communications system may not be suitable for all types of communications. For example, the electricity smart grid will need to remain isolated from any public mobile or public Internet connections. This method is seen as the most effective resilience method of preventing attacks to the grid control networks and service denial thorough malicious system overloading.

Energy:

20. What does the most effective zero carbon power sector look like in 2050? How would this be achieved?
Note: the "zero carbon power sector" includes the generation, transmission and distribution processes.

A 'zero-carbon' power sector would need more dynamic monitoring and control of a greatly increased number of geographically-dispersed points on the networks. This monitoring and control would be of a critical nature requiring specialised functionality such as mains electricity power resilience, low latency and guaranteed asymmetry. These functions are provided most cost effectively, quickly and flexibly by radio networks, but these networks require access to small suitable quantities of radio spectrum. Thus, an effective zero carbon power sector in 2050 will look like the banking sector in terms of its critical reliance on ICT in order to function.

Joint Radio Company

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

JRC and the utilities manage a significant number of fixed, mobile, and satellite links to UK-wide critical national infrastructure and is keen for their protection and the on-going access to the frequency bands in which they operate.

Indeed, access to appropriate private radio spectrum in the coming years will be critical for the intended roll-out of Smart Grids.

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 electricity and gas 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 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.