TELECOMMUNICATION ASSOCIATION
OF THE UK WATER INDUSTRY

Supported by

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Response to Ofcom's Call for input:
Potential spectrum bands to support utilities sector transformation

INTRODUCTION

This response is provided by the Telecommunications Association of the UK Water Industry (TAUWI) on behalf of its members:

Anglian Water Services Ltd	Severn Trent Water Ltd
Black Sluice Internal Drainage Board	South Staffordshire Water
Bournemouth Water	South West Water Services Ltd
Bristol Water	States of Jersey
Cambridge Water	Sutton & East Surrey Water plc
Dee Valley Water plc	Thames Water Utilities Ltd
Environment Agency	United Utilities Water plc
Essex & Suffolk Water	Affinity Water
Hartlepool Water	Wessex Water Services Ltd
Lindsey Marsh Drainage Board	Yorkshire Water Services Ltd
Welsh Water	Natural Resources Wales
Northern Ireland Water Ltd	Northumbrian Water Ltd
Scottish Water	

Atkins Ltd act as the main point of contact for TAUWI members and represent their interests on a range of matters, including responding to strategic consultations documents on their behalf. It should be noted however that direct responses may also be received from individual members.

BACKGROUND

The Association was formed in April 2004 and replaces the Telecommunications Advisory Committee (TAC) which for the previous 14 years had acted as the focus for the UK Water Industry in relation to fixed and mobile communications and scanning telemetry from a technical and regulatory aspect. Over time, the scope of TAUWI has been extended to capitalise on new opportunities resulting from emerging technologies and regulatory changes. At the same time, more emphasis is being placed on strategic issues in relation to other sectors of an organisation's operation, such as IT Systems, General Communications Infrastructure, and business requirements. TAUWI is chaired by Mr Bob Ward of United Utilities Ltd.

The industry has made and continues to make considerable investment in Operational Technology to support the remote monitoring and control of its assets. All aspects of water management, including the recovery, treatment and distribution of water, the control and monitoring of water quality and operation of flood defence systems use Telemetry to ensure compliance with statutory requirements whilst maximising operational efficiency.

Question 1: Have we correctly identified the key changes in the utilities sector that could lead to additional spectrum requirements ?

The water industry faces a number of challenges that could lead to additional spectrum requirements. These include:

- Increased monitoring of sewage overflows to increase frequency, reliability, and timeliness of data to meet regulatory reporting requirements.
- Measurement of river water quality at remote locations where currently there are no assets
- Even greater focus on leakage reduction requiring more sophisticated distribution network monitoring
- Introduction of "SMART" water meters, 3rd party sensors and edge driven IoT devices
- Deployment of more control devices & demand for more granular data in (near) real time to support analytics for energy and performance monitoring
- Withdrawal of legacy communications products; to date PSTN and associated WLR services, leased line circuits, 3G mobile and in the future GSM/CSD services.

Question 2: What alternative communication solutions might play a role in meeting the future operational communication needs of the utilities sector, alongside or instead of additional spectrum for a private network ?

The industry employs a wide range of wired and wireless communications technologies to support the remote monitoring and control of its assets, these include PSTN, ADSL, VDSL, Satellite, Private VHF and UHF Scanning Telemetry Radio, Licence Exempt Radio, 2G, 3G and 4G public cellular radio services. The choice of wireline and / or wireless technology varies from company to company and is determined by a number of factors, including cost, asset type and criticality, operational technology communications strategy, existing infrastructure, service/technology availability, integration with existing Telemetry systems etc.

Previous and present infrastructure upgrade programs undertaken by Openreach (analogue leased lines & the withdrawal of the PSTN and associated WLR services) is changing the wired solution landscape and has created uncertainties in the availability and cost of replacement IP supporting technologies. Transitional products such as SOTAP have been developed to assist with the withdrawal of Wholesale Line Rental (WLR) services, where fibre products such as SOGEA and FTTH are not yet available. However, this is a temporary service which will be withdrawn in time. As a consequence, there has been a move from wireline technologies to 4G public mobile services and private narrowband radio telemetry.

In the UK, the Water Industry has been assigned 24 National 12.5 KHz UHF duplex channels for scanning telemetry (between 457.5 and 458.5 MHz, paired with 463.0 and 464 MHz) plus an additional 8 channels, which are designated shared use with non-utility companies. The spectrum is self-managed by the industry and systems are designed using detailed technical assignment criteria and an adaptive cellular plan. The Water industry currently has an installed base of over 10,000 sites communicating via scanning telemetry and, in consideration of Q1, for a number of TAUWI members who own and operated scanning telemetry systems and have large operational areas, there is very limited scope for further expansion of their systems due to the lack of available channels.

Some systems are affected by continental interference. During periods of anomalous propagation, radio interference from wideband (1.25MHz) CDMA 450 systems operating in Scandinavian Countries severely impact the operation of Scanning Telemetry Systems in the East & South-East of the UK. As a result, affected members have had to consider alternative communication solutions and radio bands to migrate sites from UHF Scanning Telemetry.

In addition to wide area licenced scanning telemetry systems the industry also makes significant use of telemetry and tele-control equipment operating in the 458.5 to 458.95 MHz and 863 – 870 MHz licence exempt bands to support the operation and monitoring of assets at a more “local” level e.g., between Reservoir & Treatment Works, Water tank & pumping stations etc. We estimate that the installed base of equipment operating in the licence exempt band is in the order of 2500 links and for the majority of TAUWI members, the trend is increasing.

It is recognised that a limiting factor in the future growth of these systems is likely to be the availability of additional UHF2 spectrum, and the effect that Continental Interference has on some of the member’s existing systems as previously discussed. Whilst the industry has made and continues to make significant use of public 4G mobile networks and services to support their operations however there is acknowledgement that a private network addresses many of the shortcomings of the public mobile networks, top of which is the lack of any sort of useful service level or change control, but also coverage and power resilience.

A cost effective, private LTE network providing the required service level, power resilience and higher data bandwidth required by the industry, is considered by many as a natural progression in technology terms from narrowband Scanning Telemetry and alongside the other technologies will assist the water industry to meet the challenges highlighted in Question 1 and provide service at any location considering geography, power supply, service level and security required

Question 3: Are there any other spectrum bands we should consider for use by the utilities ?

None identified

Question 4: Do you have any comments on the three bandwidths we have considered that might be necessary to support a private network for utilities ?

The three bandwidths, 1.4MHz, 3MHz & 5Mhz considered align with the five potential candidate bands identified in Table 3.1 and allow comparisons to be made in terms of number of possible connections for each service type in Table 7.2. Further research and analysis of the various protocols employed in the industry along with typical data payloads needs to be carried out in order to calculate typical the bandwidth required to Water Industry.

Question 5: Do you have any comments on our approach to examining each potential candidate spectrum band, including the factors relevant to assessing suitability, and the capacity and coverage analysis provided in annexes 7 and 8 ?

The approach and selection of influencing factors to assess suitability of each potential candidate bands is clear and methodical and the Table in section 9 provides a good summary of the suitability for each band

Question 6: Do you have any comments on our overview of the 400MHz band in NI? Please consider the specific factors we have discussed in our response.

The band would appear a good candidate band, providing very good coverage and widely available LTE and utilities specific equipment. However, there are challenges. Securing 2 x 1.4 GHz of the lower 2x2MHz spectrum will require negotiation with PSNI to share or agree to cease use of the spectrum. (We note elsewhere in the CFI, Ofcom's PSNI consultation and a potential allocation of the 700MHz PPDR band). Similarly securing 2 x 1.4 GHz of the upper 2x2MHz paired spectrum will require negotiation with Arquiva. Accessing both pairs to provide 2 x 3Mhz bandwidth will involve negotiations with both parties and in all cases, require co-channel coordination checks with RAF Fylingdales.

Question 7: Do you have any comments on our overview of the 450 MHz Band in GB and NI ? Please consider the specific factors we have discussed (including the coexistence analysis in annex 9) in your response

Similar to the 400MHz band, the 450 MHz band provides very good coverage and widely available 3GPP LTE equipment from various manufacturers and suppliers for utilities use. However, the complexity and cost of planning as well as the disruption caused in migrating incumbent users to alternative frequencies, assuming they can be identified, to accommodate a private LTE network would in our view be significant. The example given for a partial replan of the band, migrating the incumbent users to clear 2 x 1.4MHz of the band to support a private LTE network in band 72 estimates that a total of 3700 business radio licenses may be affected. Given that industry have suggested the need for at least

2x3MHz of spectrum bandwidth is required to support a private network for utilities, a calculation of the potential number of licenses affected using the 2x3Mhz bandwidth would have been more appropriate. It should also be noted that the example does not allow for any additional frequency separation that may be required to manage the risk of interference between incumbent narrowband users and the private LTE network. In the case of a full replan the complexity, cost and disruption would be far greater. As pointed out in the CFI, the 450MHz band in the Republic of Ireland is aligned to the UK so any private network using the harmonised band plan in Northern Ireland would require coordination with the Republic of Ireland Regulator.

Question 8: Do you consider that changes in the spectrum environment for the 450MHz band mean there is a case for re-examining whether this band should be reconfigured in the UK to align with the harmonised band plan?

The case for private LTE network(s) to support present and future demand by utilities has been well made however given the significant cost and disruption to existing users in this band it is not clear whether there is sufficient evidence that the benefit of reconfiguring the band to accommodate a private LTE network in this band would outweigh the cost involved in carrying out band realignment and the significant disruption to the various incumbent users. A comprehensive study and assessment into the technical feasibility, cost and benefit of a band replan together with an analysis of the impact on each of the licensed sectors, including Scanning Telemetry and Licence exempt use would be required before an informed decision could be made.

Question 9: Do you have any comments on our overview of the 700MHz band in GB and NI ? Please consider the specific factors we have discussed in your response

The 700MHz PPDR band would appear a promising candidate band , subject to resolving potential co-existence challenges with supplementary downlink (SDL) mobile spectrum and developing an ecosystem of tailored devices . In terms of SDL, we note that any co-existence interference issues are more likely in urban areas where the use of SDL spectrum by operators may be greatest and the potential for interference from SDL Base Station transmissions to PDDR Base Station receivers are in areas where they are deployed within a few Km of each other. In terms of coverage, we note that Ofcom carried out a desktop propagation analysis exercise comparing coverage at 450MHz, 700Mhz and 1900MHz. In the case of 700MHz, the coverage was found to be 87% of the reference 450MHz coverage in Hilly Terrain, 91% in Flat Terrain and 92% in Urban Terrain. In addition, Ofcom found that by increasing the transmit power of the 700 MHz base station by 3dB, the predicted coverage was greater than the lower power 450MHz transmitter in all of the terrain types. This indicates that coverage at 700MHz compares very favourably to that at 450Mhz and is likely to have a positive impact on the cost of base station infrastructure. We note that in Nokia's response to the PSNI consultation, they have recently developed a 4G Base Station which supports the 700MHz PPDR band. Manufacturers of cellular routers operating in Band 28, include 4RF, Cisco and Westermo.

We understand that this band has been subject to a consultation with PSNI in Northern Ireland in which Ofcom were proposing making the 700MHz PPDR band available for use by the PSNI so potentially this band would not be available in Northern Ireland for utilities use.

Question 10: Do you have any comments on our overview of the 800 / 900MHz band in NI ? Please consider the specific factors we have discussed in your response.

Although the 800/900MHz band is potentially available in Northern Ireland, we note that the band was included with the 700MHz PPDR band Ofcom consulted on, for use by the PSNI. Like the 700MHz PDR band, there may be competing demand for this band in Northern Ireland from PSNI and further work may be required by Ofcom to resolve this competing demand. Another issue is the availability of an LTE equipment Ecosystem for utilities use would need to be developed in this band and one of the challenges may be the size of the forecast demand for devices in this band given that it is not available in mainland UK.

Question 11: Do you have any comments on our overview of the 1900MHz band in GB and NI ? Please consider the specific factors we have discussed I our response.

The overview details a number of challenges associated with the use of this band to support a private LTE network. These include co-existence constraints which necessitates transmitters operate at low powers to allow them to coexist with mobiles operating above 1920MHz. The overview concludes that the power constraint alone makes this band unsuitable for wide areas coverage. When added to the coverage characteristics of this band the resultant cost to install and maintain the base station infrastructure would be significantly greater than that operating in the 400 / 450 / 700MHz bands. The limited amount of available LTE is also a reason to not consider this band as being a suitable candidate.

Question 12: Which band(s) do you consider we should examine further , with a view to developing consultation proposals to enable their use in a private network? Please reference the factors we have considered where appropriate and provide separate answers for GB and NI if relevant.

Having reviewed the information in Ofcom's call for input document, " Potential spectrum bands to support utilities sector transformation" we consider the following bands should be considered for further examination with a view to developing consultation proposals to enable their use in a private network.

Great Britain : 700 MHz Band, 450MHz Band

Northern Ireland : 400Mhz Band, 700MHz Band , 450MHz Band

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