5G and Future Technology – Delivering the UK's Telecoms Future

5G setting the scene

Mobile connectivity is becoming ubiquitous and the expectation is that it should be available throughout the country. From the first generation of analogue phones to modern 4G enabled smart phones, people have embraced the benefits provided by increased connectivity and the applications that smart phones can control. As digital systems and mobile telephony develop it has become apparent that the mere requirement to make a telephone call is secondary to the overall advantages and opportunities that modern smart phones and increased data speeds can offer.

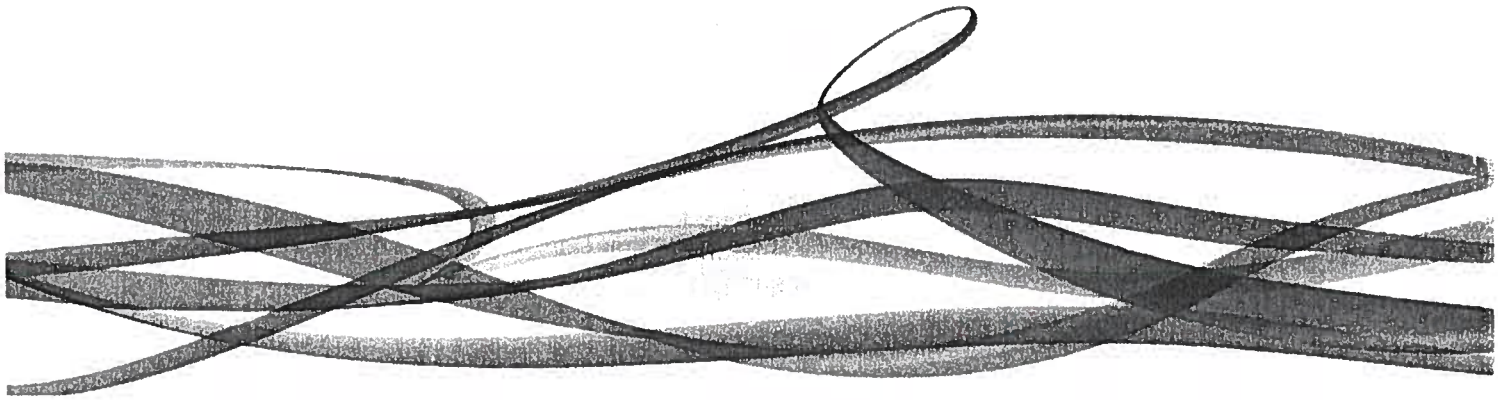
"We will build a Britain that lives on the digital frontier, with full-fibre broadband, new 5G networks and smart technologies"

BEIS Industrial Strategy – Building a Britain fit for the Future 2017

It is anticipated that the next generation of smart phones will be only a small part of wider mobile connectivity. The first generation provided voice calls, the second generation allowed basic data such as texting and the third generation offered internet access and the development of apps. Since then the smart phone has developed further and the fourth generation has brought video and much faster data speeds allowing the integration of the smart phone into wider use.

"Securing the mobile networks necessary to put the UK at the forefront of this emerging technology will be critical to the growth of our economy".

'Connected Future' National Infrastructure Commission 2016



The next generation of mobile telephony is 5G and it brings a revolutionary approach to managing spectrum and greatly increasing data speeds. The advantages this presents range from near-instant downloads of HD films to connected cars, smart medical devices and smart cities.

"5G has the potential to dramatically transform the way we go about our daily lives, and we want the citizens of the UK to be amongst the first to experience all the opportunities and benefits this new technology will bring...."

Margot James, the government minister for digital.

5G also integrates the previous generations of mobile telephony through either utilising the existing radio spectrum and/or combining the advantages of previous generations and using multiple platforms to manage coverage and capacity. It is estimated that 5G will directly contribute to an additional £7 Billion a year to the UK economy in just six years from roll-out. Although 5G will undoubtedly bring new opportunities and huge benefits to society, we cannot escape from the requirement that new structures, antennas and ancillary equipment will be needed. But to do so the network needs to be surveyed, designed and planning approval obtained. It has been acknowledged by Government that we must ensure that we have the infrastructure in place to deliver 5G across our major centres and transport networks.

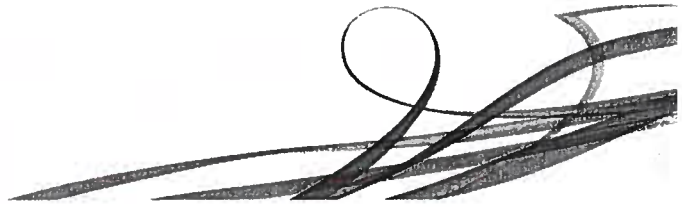
The Next Generation

The growth of digital connectivity over the last few decades has transformed all aspects of life within the UK. It has provided the opportunity to work differently, to socialise and interact differently, to bring the world closer and to offer new commercial opportunities. The internet and mobile connectivity rely upon the deployment of new fibre networks. Utilising these fibre networks allows each mobile base station to link back into the wider core network, however, the requirements in the future are for ubiquitous coverage and this will mean the more complex, more remote locations throughout the country will need further new installations. In addition, 5G offers download speeds far in excess of what can be achieved today, even by fixed line broadband. Such increased speeds and low latency provides the potential for far greater opportunities.

Examples of this new world that will emerge from ubiquitous 5G coverage involves such things as connected and autonomous vehicles, traffic management, smart manufacturing with heterogenous autonomous machines, direct machine to machine communication, advanced medical devices, automated agriculture, far greater security provision, more stable and reliable connectivity and advances in further application development with uses not yet identified. All of the above provides an insight into the future development of connectivity in our modern world and also provides a further insight into the expected minimum eight-fold increase in data usage by each mobile operator over the next 5-6 years.

Current Legislative Environment

The existing 4G network rollout has been relatively rapid. However, it was apparent that there were certain restrictions and complications, particularly within the Planning regime, that hindered a more effective rollout. Telecoms Planning is governed by secondary legislation set by central government and the Devolved Authorities and much work has been made to lessen the adverse effects of previous generations of legislation. In England, Part 16 of the General



Permitted Development Order (2016 SI No. 1040) was revised in November 2016 and increased permitted development rights for Electronic Communications Code System Operators. In order to benefit from the potential that 5G offers, these regulations will need to be relaxed further and altered to address the particular requirements of the new infrastructure proposed. This approach is supported in National Planning Policy:

"Advanced, high quality and reliable communications infrastructure is essential for economic growth and social well-being. Planning policies and decisions should support the expansion of electronic communications networks, including next generation mobile technology (such as 5G) and full fibre broadband connections".

National Planning Policy Framework July 2018

Consultation is ongoing with the relevant government departments in order that a better understanding of the requirements is being presented and understood, however, it is imperative that the UK prepares itself in order to enable this new technology and to lessen the burden of over complex regulations. Reducing barriers to network deployment should therefore be considered a strategic necessity given the potential for 5G to help digitise wider areas of the economy. Mobile telephony is seen as a critical aspect of the future of our country and the Government directly supports the increase and expansion of services and new technology:

"Getting 5G deployment right will be critical in a future where connectivity is becoming integral to almost all parts of the economy, and the UK will put its future growth and competitiveness at risk it if falls behind".

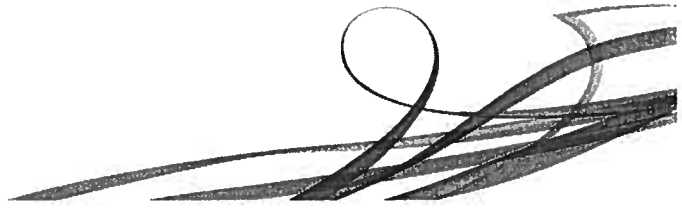
'Connected Future' National Infrastructure Commission 2016

New Equipment

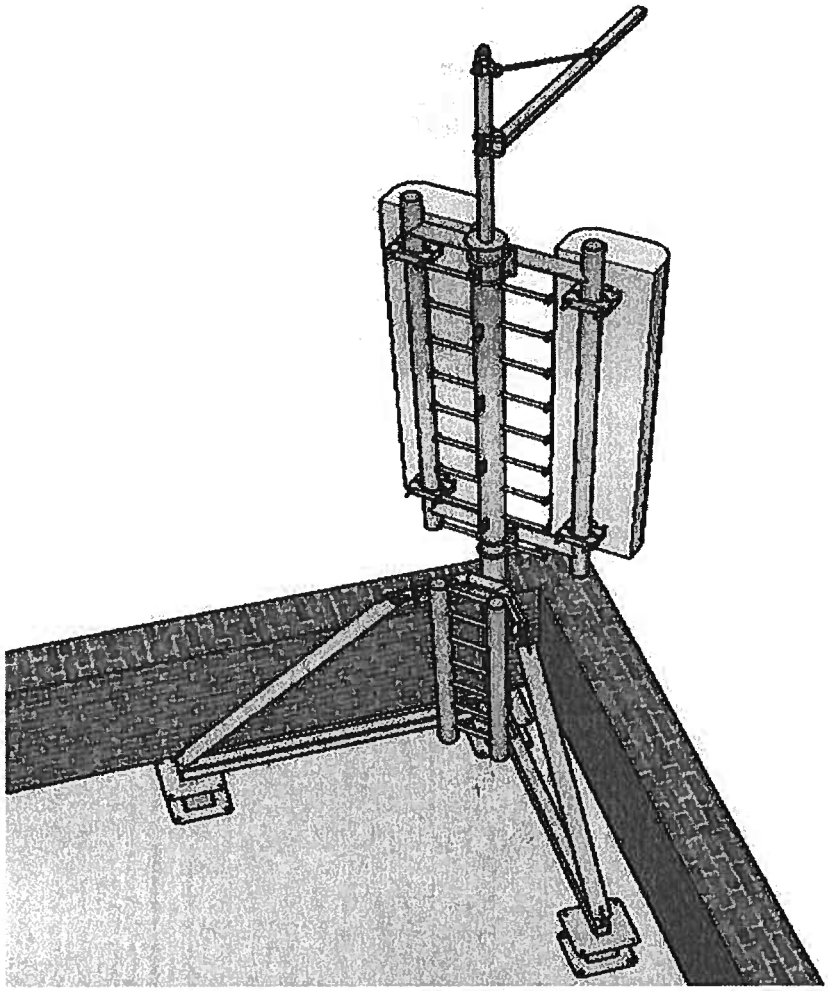
The initial rollout of equipment will be concentrated on a macro level, that being the upgrading of main hub sites but also coupled with new standalone sites. The potential for Small Cells will evolve as the technology is taken up. 5G has to be deployed smoothly and effectively and as such many existing rooftops and stand-alone greenfield towers will need to be upgraded and redeveloped to accommodate the new equipment and antennas.

5G operates across multiple spectrums and therefore requires additional antennas and new equipment cabinets. The signals that are broadcast are more prone to the shadowing effect of adjacent buildings or structures, and also the 'clipping' effect of building edges. Consequently, the location of antennas on existing rooftops is critical to its effectiveness. All new proposals will be set out in associated drawings and the broadcast levels will also be within agreed ICNIRP (International Commission for Non-Ionising Radiation Protection) guidelines.

The higher frequencies that 5G will use can provide more bandwidth and thus greater capacity but the signal will not travel as far as those of previous generations. The implications to the built environment will be that more infrastructure needs to be deployed with the added significant increase in capital required. In order to meet future demands for connectivity the new installations will have to be designed to optimise the network and thus provide a public benefit in addition to the existing telecoms generations and frequencies used. Additional

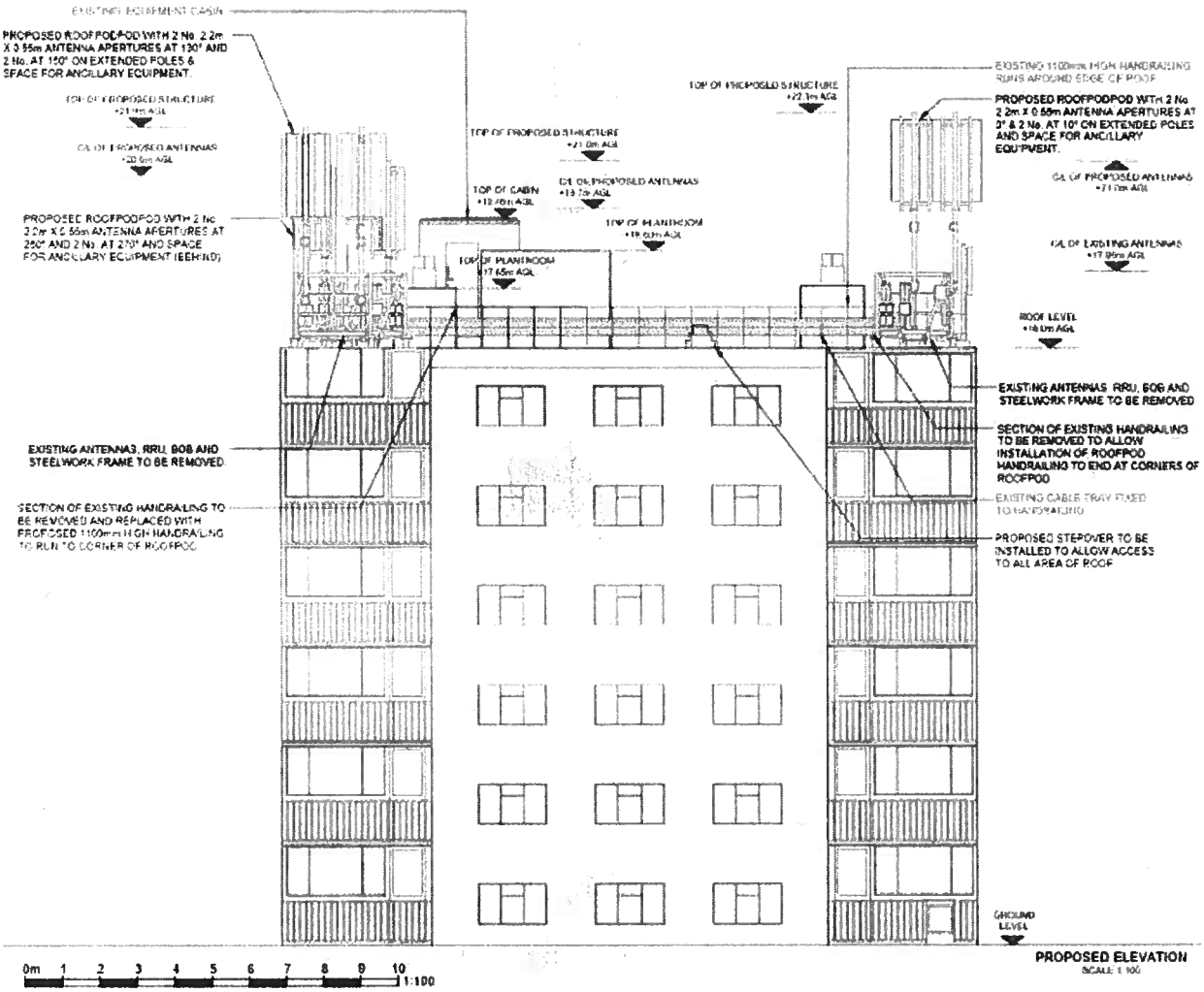


structures and ancillary equipment on existing sites will also be complemented by new sites and it is anticipated that in high demand areas such as city centres further new installations will be required.



Note typical location of antennas at roof edge

It is anticipated that many of the proposals will involve locating antennas closer to the building edge to avoid such 'clipping' and if this is not possible then the antennas may have to be located on structures in the centre of the roof but raised to a height to avoid the same 'clipping' issues. This presents more complex issues for both the designers and for the Local Planning Authorities, where previously 2G, 3G or 4G systems could be accommodated without the need for extra supporting structures or raising the antenna heights. 5G has a far more complex radio requirement and is affected far more than existing systems by surrounding obstructions and structures. Consequently, in order to install new equipment supporting the 5G rollout designs will be very different to those of the existing networks.



Note increased number of antennas closer to the building edge

In order for the UK to benefit from the huge potential of 5G Local Planning Authorities will have to weigh the Public Benefits of such connectivity with the requirements to instruct and manage the built environment. Central Government understands that this may present concerns with the various design solutions proposed but it is important that all Local Planning Authorities understand the technical needs of 5G and better understands the wider advantages of such new technology. This is further emphasised within the National Infrastructure Commission's report in 2016, where National Digital Strategy will be directed through the Economy and Industrial Strategy Cabinet Committee in order to:

"Support and challenge local government in their plans to enable the delivery of digital infrastructure; both in terms of ensuring that these plans help the UK to meet its national objectives, and that local authorities develop consistent approaches to support the deployment of mobile infrastructure across the country".

'Connected Future', National Infrastructure Commission 2016

Outcomes

Central Government has expressed a support for new telecoms installations and the deployment of new technology. It is seen as essential for the country to develop and exploit the advantages of such new technology to the direct benefit of the public and the economy. It is seen that Local Government is key to the effective deployment of new technology and the upgrading of existing technology. Support and understanding from Local Government is needed to process Planning Applications, to offer the use of publicly owned assets to locate new equipment and to liaise with Mobile Network Operators in creating the infrastructure required. This is supported by the encouragement the National Infrastructure Commission has indicated in their Connected Future report 2016:

"Local government should actively facilitate the deployment of mobile telecoms infrastructure".

Connected Future, National Infrastructure Commission 2016

It is suggested that Local Government will directly benefit from new and improved connectivity which will directly improve the local economy, social interaction, improved services, higher productivity and the reduction of social exclusion. The introduction of new infrastructure is required for all of the reasons above but also to prepare the UK for wider and greater advances benefiting from ubiquitous coverage and improved connectivity.

