mobilising the 5G network

Peter Jones and **Daphne Comfort** look at the proposed roll-out of 5G mobile phone technology and some of the planning issues associated with the development of 5G networks

Ericsson

5G requires the widespread installation of small cells, or antennae

The first wave of commercial 5G ('fifth generation') mobile technology is breaking within the UK. In February 2019, O2, for example, announced that the company will commence the roll-out of its next-generation ultra-fast 5G mobile network in Belfast, Cardiff, Edinburgh and London during 2019, and in April 2019 Vodafone announced the live testing of its 5G system in Newbury. While the government has stated that it 'has a clear ambition for the UK to be a global leader in the next generation of mobile technology', it has also recognised that 'planning regulations are a key factor influencing a network infrastructure provider's ability to expand its network'.[1] This article outlines the main characteristics of 5G and the proposed roll-out of 5G mobile technology, and discusses some of the planning issues associated with the development of 5G networks.

5G

5G is the fifth generation of mobile communication technologies. In this context the term 'generation' usually refers to a change in the fundamental nature of the service – such as higher peak bit rates and higher capacity for many simultaneous data transfers. In the first generation (G1), mobile phones were simply used to make calls, while 2G, which appeared in 1991, enabled users to send and receive text messages and pictures. The introduction of 3G enabled internet connections to be made from mobile phones, and 4G introduced improved speeds, faster response times, and clear voice calls.

5G requires the widespread installation of small cells, or antennae, to deliver ultra-fast speeds to mobile users, and operates on different radio spectrum frequencies from 4G. Ofcom has simply suggested that 5G 'is expected to deliver faster

and better mobile broadband',[2] while the mobile communications industry claims that compared with its predecessor 5G offers much faster data download and upload speeds, wider coverage and more stable connections, while making better use of the radio spectrum and enabling far more devices to access the mobile internet at the same time.

More generally, there are claims that '5G promises a step change in mobile connectivity with enormous potential to boost productivity and grow the economy'[1] and that 'whilst it is impossible to predict exactly where 5G will make the biggest impact, sectors across the whole of the economy are expected to make use of new 5G technologies and applications'.[1] Ofcom claims that 'communication services are becoming ever more important to UK people and businesses and they expect to be able to access them everywhere they live, work or travel';[2] and in identifying the benefits of 5G has argued that '5G is expected to enable both an evolution of existing services and revolutionary new services'.[2]

More specifically, Ofcom has identified 'three broad categories of use for 5G', namely 'improved quality of experience for wireless broadband', 'capacity for the Internet of Things', and 'revolutionary new services'.[2] In addressing the second of these uses, Ofcom listed a number of potential benefits, including benefits in health and social care in that the 'internet of things' will, for example, enable remote health monitoring and create more timely alerts for nurses and carers. In the utilities, 5G-enabled smart meters and thermostats will facilitate more accurate billing and greater control of energy consumption. At the same time, possible applications in the optimisation of street lighting, the monitoring of car parking and the timing of rubbish collection may contribute to the development of smart cities. Within the manufacturing sector of the economy, 5G may enable companies to make greater use of robotics and the remote control of industrial processes.

Ofcom has also suggested that 5G has the potential to produce a series of revolutionary new services. Harnessing the 'tactile Internet', could, for example, enable medical students to practice surgery in a virtual reality environment and thus ''feel' the procedures as they develop their skills in a safe setting'.[2] More widely, 5G may also have a role to play in facilitating driverless cars.

The government announced its *5G Strategy for the UK* in 2017.[1] Underlying this strategy is the ambition that 'the UK should be a global leader in 5G so that we can take early advantage of its potential and help to create a world-leading digital economy that works for everyone'.[1] The strategy document claims that 'being at the forefront of the development and deployment of 5G networks will help the UK digital sector compete in global markets for a range of products and services; enhance UK capabilities at home and overseas; and help attract inward investment'.[1]

The strategy outlines the steps that the government would take to build the economic case for investment in 5G and create an appropriate regulatory framework; and outlines the actions that it is taking to improve mobile network access, its belief that local authorities have a vital role to play in supporting the roll-out of 5G networks, and the actions it plans to ensure the safe and secure deployment of 5G. In 'building the economic case' for investment in 5G, for example, the strategy document emphasises the potential economic benefits of 5G, in that enabling business to be done on the move will provide 'access to information and services anywhere', thus 'enabling new markets to develop and reshaping others'.

All four of the UK's national mobile network operators – namely EE, O2, Vodafone, and Three – have ambitious plans to roll out their 5G networks. EE, for example, is to launch 5G across 16 cities, including London, Edinburgh, Cardiff, Belfast, Glasgow, Birmingham, Manchester, Leeds, Bristol and Sheffield during 2019. Within some of these cities initial installations are targeted on the busiest areas, including Hyde Park in London, Birmingham's Bull Ring, and the Edinburgh Waverley railway station. In a similar vein, Vodafone began its roll-out of 5G in Manchester, Bristol, Cardiff and Liverpool in March 2019, and announced plans to launch 5G in a number of towns and cities across the UK, including Bournemouth, Blackpool, Portsmouth, Reading, Guildford and Stoke-on-Trent, later in the year.

In February 2017, O2 announced it would kick-start its 5G roll-out in London, Edinburgh, Cardiff and Belfast in 2019, and that 5G would begin to be available in other areas of the UK from 2020 onwards. Three, the smallest of the national network operators, seems likely to launch its network before late 2019, with launches in London, Birmingham, Manchester, and possibly Swindon.

While all four national network operators have ambitious plans for their 5G networks and for the wide range of applications and services they will support and facilitate, they have also emphasised the need for greater government support (including financial support) to enable 5G to harness its full potential – for example in rolling out networks in remote rural areas. While the government has promised to invest £1.2 billion in 5G and full-fibre connectivity, the industry has claimed that this figure is dwarfed by Germany's £100 billion investment in similar developments.[3] For its part the Department for Culture, Media and Sport and HM Treasury have emphasised that 'the vast majority of the capital investment required for both full-fibre and 5G rollout will need to come from the private sector'.[1]

At the same time, the national mobile operators have been calling for the government to review and relax planning regulations on the grounds that the

current mobile infrastructure cannot sufficiently support the roll-out of 5G.

Planning issues

The *5G Strategy for the UK* issued by the Department for Culture, Media and Sport and HM Treasury explicitly recognises that planning regulations are a key factor in influencing network expansion, because 'they govern where sites can be built and the physical appearance of the equipment that can be installed on such sites'.[1]

In addressing planning policies and regulations, a number of issues merit attention. The National Planning Policy Framework (NPPF)[4] stresses (in para. 112) that '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'. At the same time, the NPPF also emphasises that local planning authorities should ensure that they have the evidence to demonstrate that new electronic communications infrastructure will not interfere with other electrical equipment or air traffic services, and that new buildings will not interfere with existing electronic communication services.

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Furthermore, local planning authorities are advised (in para. 116) that they 'must determine applications on planning grounds only' and that 'they should not seek to prevent competition between different operators, question the need for an electronic communications system or set health safeguards different from the International Commission guidelines for public exposure'.

There are planning issues concerning the installation of both taller masts (and here operators look either to increase the height of existing masts or to construct new ones) and of small antennae cells within new networks. The new masts also require the installation of larger equipment cabinets, which can require more land and new fencing. Plans for taller phone masts often face opposition from some people living in the surrounding area, who feel that they damage the appearance of local landscapes, and who have cited health concerns over public health risks associated with wireless radiation. However, the operators have argued that these masts are becoming just as important as other utilities installations and that they should be given high priority, and that consequently the planning process should be streamlined and application determination times reduced.

In rural areas, operators would certainly like to build taller masts to improve coverage, and in densely populated urban areas, in town and city centres and at transport hubs, shopping centres, sports stadiums, as the demand for mobile connectivity grows, so new 5G mobile technologies will also require the widespread deployment of large numbers of small cells to deliver ultra-fast speeds to mobile users. Indeed, Oughton *et al.*[5] have suggested that 'while new generations of mobile technology can be dominated by marketing spin, there is consensus that network densification via smaller cells will be a key technique for 5G networks'. This is because the super-high frequencies used by 5G only work if there is a clear, direct line-of-sight between the antenna and the device receiving the signal.

A study for the National Infrastructure Commission[6] has estimated that as many as 42,000 small cells or antennae could be required to deliver the 'ultra-fast broadband speeds expected of future networks in an area the size of the City of London'. Nationally, some trade sources have suggested that up to 500,000 small antennae could be required. This new equipment would be deployed on a range of existing street furniture such as lamp posts and street signs, and on the sides of buildings.

The extent of permitted development rights which allow operators to deploy the necessary equipment (principally masts, antennae, cabinets and telegraph poles) without submitting a full planning application vary across England and the devolved nations of the UK. Permitted development rights were reformed in England in 2018 and in Scotland in 2017. In England, for example, permitted development rights cover new masts less than 25 metres in height (excluding antennae), but only up to 20 metres in height (excluding antennae) on Article 2(3) land, which includes designated Conservation Areas, Areas of Outstanding Natural Beauty, National Parks, the Norfolk Broads, and World Heritage Sites. Small antennae are permitted development in England providing the visual impact is minimised, but the precise conditions are detailed and vary depending on whether the antennae will be on a dwelling, and on whether they will be on Article 2(3) land.

In Wales, the legislation was last updated in 2014, but in 2017 the Welsh Government commissioned a study[7] to investigate whether permitted development rights applying to 'mobile telecommunications infrastructure are fit for purpose'. Two of the guidelines underpinning this investigation were the need to reflect 'the topography and population

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distribution' of Wales, and to balance 'the local economic and societal benefits of having broad mobile signal coverage (and capacity) with the need to safeguard sensitive landscapes and protect residential amenity'. The study recommended bringing existing permitted development rights into line with those in England and Scotland, but, at the time of writing, no changes have been announced. Indeed, in January 2019 the Economy, Infrastructure and Skills Committee of the National Assembly for Wales argued[8] that 'changes to permitted development should either be implemented, or an explanation given as to why they have been rejected'.

More generally, there are concerns that the national network operators face inconsistencies and complexities in working with local planning authorities. In 2018 telecommunications, media and technology consultants Analysys Mason, for example, argued[9] for a need to develop guidelines 'to improve the consistency in how local authorities apply planning rules, while still taking account of the regulations that vary across the devolved nations of the UK, such that quicker and less-bureaucratic processes can be enabled to aid the deployment of both mobile macro sites and small cells'. They also suggested that there were 'difficulties in communicating between local authorities and planners, and between the industry and local authorities'.

In identifying the 'implications' of these concerns, Analysys Mason claimed that there was a risk that 'network providers are likely to plan more-conservative roll-outs to mitigate the risk of difficult and protracted deployment processes for 5G', that 'such roll-outs will potentially reduce the socioeconomic benefits of 5G deployment in the UK', and that it is 'important for all stakeholders to work together with a view to streamlining mobile site planning processes'.

Concluding reflections

In a recent House of Commons Briefing Paper, Hutton and Baker[10] reported that the government 'recognises the need to keep planning regulation under review and to listen to suggestions from industry for how new technology is best supported in the planning regime'. Furthermore, they reported that the government 'will continue to work with the sector to promote understanding and take-up of the wide range of planning reforms brought forward and reflect on them to understand where the current planning regime could further support the deployment of digital infrastructure'. That said, some concluding reflections merit attention.

Given the government's commitment to see the planning regime support the roll-out of 5G, and that the stated purpose of the planning system in England is 'to contribute to the achievement of sustainable development', as set out in the NPPF (para. 7), this begs the question of if, and how, the development of 5G might contribute to sustainable development.

On the one hand, West,[11] writing under the banner of the Brookings Institution, has argued that 'with the emerging 5G network and the internet of things, it is possible to deploy technology in ways that protect the environment and promote long-term sustainability'. In a similar vein, Earth 911, a privately owned not-for-profit company that focuses upon recycling, has claimed[12] that in 'simple terms, 5G technology can help facilitate a cleaner, greener, more environmentally conscious future by making things more efficient'. By way of an illustration, Earth 911 suggested: 'Imagine a world in which self-driving cars, leveraging electric power for their journey, travel with millimeter precision to their destination – the effect would be fewer road blocks, traffic delays and accidents, plus more-efficient driving manners.'

On the other hand, the dominant messages surrounding the roll-out of mobile 5G focus on continuing growth. In April 2019 Barclays, for example, claimed[13] that 'the introduction of a 5G mobile telecommunications network could increase annual UK business revenues by up to £15.7 billion by 2025', and that manufacturing, distribution,

professional services and business services are the sectors likely to see the highest growth. As such, the development of 5G mobile technology is justified by its potential (and in many ways much needed) contribution to economic growth, despite some commentators' more general concerns that continuing economic growth is incompatible with sustainability. Daly, for example, has suggested[14] that 'there is an obvious physical conflict between the growth of the economy and the preservation of the physical environment', while Higgins has argued[15] that 'the economic growth we know today is diametrically opposed to the sustainability of our planet'.

Finally, in arguing that 'government needs to start treating mobile networks like a critical piece of national infrastructure', Mark Evans, the Chief Executive Officer of Telefonica UK, which trades as O2, has claimed:

> *'as we prepare to roll out 5G technology, we stand on the cusp of a new technological revolution. Developments such as artificial intelligence, machine learning, the internet of things, smart cities and virtual reality are set to completely challenge the way we live our lives.'*[16]

Perhaps rather cynically, and in the wake of the result of the Brexit referendum in 2016, the current authors are left wondering how many people within the UK want to face up to having the way they live their lives fundamentally challenged.

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Notes

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