

# Executive Summary

The smart city agenda, pushing cities to use modern technology to better integrate their communicative, physical and digital infrastructure, is advancing globally with the UK at its forefront. This report focuses on two risks associated with the smart city agenda: the provision of physical infrastructure to support the increase in demand on local energy distribution networks and the inclusivity of the necessary roll-out of improvements.

Much is made of the personal and political implications of the vastly improving *digital* infrastructure in modern cities. The rapid rise of the 'Internet of Things' – everyday items like watches and speakers embedded with smart, interconnected technology – looks set to characterise human development in the years and decades to come. Running parallel to this process is a move away from carbon technologies, with governments worldwide looking to a near-future of decarbonised transport and drastically reduced industrial emissions. It is in this context that the smart city exists: in urban areas, not only is the interconnectivity of modern society intensified, the ecological imperative is far greater. Our ability to monitor and manage our energy usage in urban areas is critical to improving their liveability and sustainability. Yet the ability of new, digital technologies to help improve the way we use resources, from time to fossil fuels, depends entirely on our ability to power them.

## Challenges ahead

Debates around smart cities have often failed to consider the supply and management of *physical* infrastructure, particularly as it relates to energy efficiency and sustainable economic growth; two central goals of the smart city. Physical infrastructure, including energy distribution networks and local transport networks, should be successfully implemented before digital infrastructure can allow city officials and residents to manage their energy consumption toward efficiency and sustainability. While technologies such as smart meters can help manage electricity usage far more efficiently, there remains good reason to be concerned that take-up of new technologies will lead to a strain on the existing energy network capacity. In this report, we focus particularly on the energy issue as it relates to electric vehicles. Uptake of electric vehicles is accelerating month-on-month and the UK Government is committed to phasing out fuel-burning vehicles by 2040. In spite of this impressive uptake and clear *stated* direction from government, are we sending clear enough signals to the market that electric vehicles are the future? Furthermore, do we have the infrastructure capacity to match our ambitions?

The uptake of electric vehicles is key to the alleviation of another problem we focus on in this report: air quality in urban areas. High NO<sub>2</sub> concentrations predominate in cities, on major roads and at pinch-points of congestion, for instance ports and crossings like bridges and tunnels. While data coverage is poor and government's modelling has been criticised for being unreliable<sup>1</sup>, it

<sup>1</sup> EHN (2016) – Defra air quality modelling based on 'fantasy data'

is clear the problem is most acute in urban areas. All but one UK 'air quality management zones' have illegal levels of NO<sub>2</sub><sup>2</sup>, exceeding statutory European Union (EU) targets and often by significant amounts. The smart city agenda promises cleaner and more efficient transport, through better managed public transport flows and prevalence of electric vehicles. The mounting tenor of the public debate on air quality makes implementing the changes necessary to accelerate the smart city agenda a political, as well as environmental, imperative.

### A policy programme for smart cities

The issue of fairness must be central here. Smart energy has huge implications for helping people out of fuel poverty, as households will be better able to predict their bills and manage their usage, yet these benefits can only be felt through a considered roll-out of the physical infrastructure needed to deliver the smart grid. There is a risk that the infrastructure needed to support the smart city agenda is rolled-out unevenly, with areas which are already deprived being left behind more affluent places.

**Recommendation #1: Upgrades to networks to enable smart energy and the roll-out of EVs must be done fairly to ensure equitable opportunities for households across different socioeconomic backgrounds and to ensure existing disparities are not exacerbated.**

### New regulatory framework for the smart grid

In order to produce optimal and sustainable cities, the full potential of digital infrastructure must be unlocked through pre-emptive investment in energy infrastructure. The UK Government does not offer a cohesive strategy on transitioning to a smart city. What the UK Government can do, however, is provide a 'market making' approach to try and ensure that the right conditions are available to encourage energy network providers to invest in distribution networks, and consumers to take up new technologies. Businesses and cities cannot, on their own, solve the obstacles that hinder the growth of smart infrastructure and technologies. A key barrier to readying our cities for electric vehicles, recently acknowledged by the Department for Business, Energy and Industrial Strategy (BEIS) select committee, is the ability of energy network providers to invest ahead of demand. Currently, providers are restricted to investing only where there is proven need (investing after demand). Given the inevitable rise in electricity usage as a fuel source, not just in cars but also for central heating, and the increasing reliance on constant connectivity as the smart city agenda advances, we argue that this restriction should be lifted. In addition, we argue that charging points and associated grid upgrades should be provided ahead of demand, in order for private business and citizens to be fully confident of electric vehicles as the technology of future road transport in Britain.

**Recommendation #2: Ofgem should loosen regulations to allow energy network providers to invest ahead of demand.**

The success of the smart city agenda will ultimately rely on how cities, the private sector and other stakeholders support and use it. The market for 'smart' technologies is relatively new; the framework within which these technologies can be harnessed and integrated to best effect has only just begun to be developed. It falls upon city authorities – who know their place and people better than distant authorities – to work with the private sector and communities to make the most of 'the smart agenda' and serve distinct urban needs.

Cities will experience the transition in different ways but the current regulatory framework will limit their ability to initiate and respond to this change. The situation therefore calls for more localised regulation. As energy network providers preside over natural monopolies, it is of course crucial that they are

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<sup>2</sup> Defra (2017) – Air Pollution in the UK 2016

regulated by Ofgem. Locally-specific decisions on infrastructure upgrade, however, are better understood and managed at the local level. Local regulation should inevitably be nationally coordinated, while regulatory measures should be proposed locally on a city-by-city basis at the level of the energy distribution system. Central policy must not become disconnected from regional regulatory bodies, but should work with them to ensure regionally and locally specific outcomes. This is why we call for certain regulatory powers of Ofgem to be devolved so that cities have the freedom to upgrade their infrastructure in a way that is tactile and responsive to their energy needs.

**Recommendation #3: Certain regulatory powers of Ofgem should be regionally devolved so that cities can develop their own energy policy.**

### Local authorities: the strategic role

Better physical infrastructure and smart technology could, potentially, result in less equitable outcomes. Those in higher income areas could have a higher concentration of residents willing to invest in smart technologies. This in turn could lower bills in areas of high income, while having little impact on energy bills in neighbouring lower income areas. In other words, the higher the income of an area, the greater the chances of reinvestment in energy infrastructure. If not implemented strategically and with knowledge of socioeconomic differences between areas, the location of upgrades to energy distribution networks and later use of smart technologies could perpetuate and deepen existing socioeconomic differences. Long term strategic thinking is required in cities and their wider city-regions to ensure that everyone can benefit from the upcoming change. This is especially important as, through their energy bills, the costs of the smart grid will be socialised. Neighbouring local authorities need to work together as consortia, with each other and with the private sector, to ensure that the various initiatives amounting to a smart city transformation are coordinated and work for everyone in the area.

**Recommendation #4: Local authorities should be given a mandate to form consortia and develop smart city plans which integrate various initiatives across geographical boundaries.**

Regulatory changes can only go so far, however. Adoption of the smart cities agenda presents a spectrum of required changes, with changes to physical infrastructure on one end and changes to cultural behaviour on the other. As one city councillor told us during research for this report, “decision-makers must take the electorate with them”. After years of telling the public to use less energy, the advent of the smart grid could lead to people using more electricity; for cars, heating and other applications. This means educating people as to the benefits of electric vehicles, as stated above, but also on the benefits of using public transport or ‘active transport’ such as cycling and walking.

**Recommendation #5: Public awareness of the environmental and financial benefits of smart city growth and development should be increased.**

### Network providers and local authorities in partnership

The smart city agenda is based on integration of a city’s various functions across networks. As such, its success depends entirely on coordinated collaboration. Where the smart grid is concerned, collaboration must be primarily between local government and energy network providers. Maximising the benefits of the smart city through the successful implementation of all the recommendations outlined above depends on a close and collaborative relationship between energy network providers and local authorities.

**Recommendation #6: Local government should work with private energy network providers to deliver physical infrastructure.**

Part of this collaboration will involve the sharing of data. Ofgem is currently holding a funding competition for electricity network innovation, with network

providers putting forward several proposals for bringing energy distribution forward with the smart agenda. As part of the research for this report, we have seen examples of coordinated efforts by network companies which aim to investigate solutions for electric vehicles by engaging relevant stakeholders across the energy and transport networks and the planning system. Central to this is the sharing of information. This kind of joined-up solution is key to realising the full potential of the smart grid, information should be able to flow freely between city planners, transport officials and energy network providers in order for proper integration of city functions.

**Recommendation #7: In developing smart city strategies, private providers should be given access to public data and vice versa.**

### Central government: direction and funding

Without dedicated direction and funding from central government, fair and equivalent access to energy infrastructure upgrades cannot be achieved. To achieve the recommendations put forward in this report; energy providers, local authorities and manufacturers must be working within roughly the same technological parameters whilst adapting their individual solutions to their place. For this reason, echoing the BEIS select committee, we call for greater standardisation on what kind of charging points are desired for electric vehicles. Furthermore, the relationship between level of electric vehicle uptake and level of infrastructure upgrade required must be standardised and revealed in detail by central government.

**Recommendation #8: Government must produce a standardised framework for electric vehicle charging equipment and associated infrastructure upgrade requirement.**



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