THE LONDON SCHOOL OF ECONOMICS AND POLITICAL SCIENCE

Building Back Faster

Utility connection competition and UK policy priorities for the 2020s

Tony Hockley PhD ▪ October 2020

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The author is an economist specialised in processes of public policy reform. He has worked on policy in a wide range of settings; in government on health policy, in the life sciences industry, and in aviation regulation during the period of regulatory reform to liberalise international air services. Tony is Director of a policy research business and a Visiting Senior Fellow at the London School of Economics & Political Science (LSE), where he teaches a postgraduate course in Behavioural Public Policy.

Battersea Power Station development

An independent electricity network selected to serve 3,500 apartments & commercial units

Photo: Robert Likovszki/Unsplash

1. Foreword

Dermot Nolan, former CEO, OFGEM

The UK faces a major transition over the next 30 years. It has committed in law to achieving a net-zero carbon goal by 2050, which will almost certainly lead to major changes in the energy system with electricity demand likely to rise significantly as electric vehicles start to be used in much greater numbers. As this report notes, there will be a myriad of new developments, as the demand for new homes seems likely to grow, and businesses, hospitals and other users will all be looking to connect quickly and efficiently to the energy system, as well as the communications bandwidth, that will provide them with the lifeblood they need to function.

Against this background, this report presents a fascinating examination of the possibilities of using independent networks as a vehicle to deliver connections at the level of speed, cost and efficiency that UK users will require. The traditional monopoly network system has been altered in the last 20 years to allow developers to connect using independent networks and - as the report details - has resulted in significant increases in the number of cases where developers have chosen to contract with an independent rather than a traditional network.

It is not my purpose to comment on which is the '"better" option for users, though as a former regulator I strongly believe in the benefits of competition and choice. Without taking a position on the relative merits of the independents vs traditional networks, I believe that the much sought after (if somewhat difficult to identify) "level playing field" and the principle of non-discrimination is important for any regulatory system and will facilitate open competition that will benefit users. But in any case, it seems clear that ensuring that the UK has a framework that facilitates connections being made in as efficient a manner as possible is key to users and to the economy as a whole, and in that regard this report should be seen as an important contribution to the debate and one that I hope will lead to further discussion and action.

Dermot Nolan

October 2020

2. Executive Summary

Utility connections are the life-giving arteries of any new development. They link users to the regional and national networks providing essential services for energy, water, and communications. Too often it has been a struggle to get these development arteries in place at the right time and exactly as needed. Over the past 20 years, however, the competition and choice offered by independent providers has meant that developers are no longer wholly dependent upon their regional network utility operators to meet their connection needs. Market liberalisation has fostered a new industry focused on meeting developer needs for fast and efficient utility networks on their sites. At the same time the complexity of utility requirements has grown as has the demand for speed. Such is the growth of this focused industry that most new gas and electricity connections are now provided by independents.

In stark contrast to other market liberalisations, however, the rise of competition in connections has, so far, been a quiet revolution for new developments. There has been none of the boom and bust of other liberalisations, with a rapid rise of new entrants, followed by failures of many and an equally rapid market concentration. Neither have there been reports of falling service standards or hidden costs. The nature of the sector does not lend itself to easy entry, given the need for high levels of technical expertise and associated regulatory hurdles, and the fact that network ownership itself represents a long-term commitment whose rewards lie in efficiency gains rather than price increases.

In policy terms, however, the extraordinarily low profile of this quiet revolution may now put these hard-won gains at risk. These local distribution networks still represent something of a niche within the context of national utility markets from generation to end user. Small policy changes in the future could, therefore, have significant impacts on independent networks, running the risk of significant collateral damage to this new industry. In developing this paper, for example, it became apparent that it has received negligible policy attention, save when absolutely necessary. Other than data from the Lloyds Register accreditation systems for contractors even basic data on the independent network connections can only be obtained from OFGEM by detailed requests under the Freedom of Information Act. Policy papers or commentaries on independent networks are largely conspicuous by their absence. This requires urgent change if the sector is to continue to benefit industrial and residential developments free from the risk of unintended consequences from future policy decisions. This paper considers the contribution of this new sector to the achievement of current public policy goals, not least the need to build back from the coronavirus pandemic, but building faster, better, and greener than in the past.

Demographic pressure on housing has accelerated as the UK population has grown, from longer lives and net migration, and the number of single occupant households grows. Housebuilding targets designed to help address the resultant housing crisis have become increasingly ambitious yet difficult to achieve, and housing costs continue to rise.

The coronavirus pandemic of 2020 forced a step change in home working, which further highlighted the difficult conditions in which much of the population live. Resort to video communications as a basic work tool tested not only the physical space of shared properties but also made the digital divide an immediate and serious source of inequality as it determined whether people could or could not work effectively. Those able to live in a home of their own with a fibre connection would have an important advantage in work continuity over those in shared accommodated reliant on copper wires and mobile data. Spreading these benefits as quickly as possible and as efficiently as possible is central to the rise of independent connections.

Over the past 20 years the rather sclerotic system of monopoly connections has been replaced, with completely new choices for developers. This has supported new ways of working. Unlike the fixed relationship with the regional utility monopolies, developers can now choose a network connections partner:

- to provide them with customer-focused utility connections
- for each or all of their developments throughout the countries and regions of the UK
- for each or all of the roles of designing, building, and adopting their network connections a network connection partner for each or all of their utilities
- to be integrated into their development team

These new choices not only enable innovations to support development efficiency and cost reduction, but can also break the cycle of blame that can develop when developers and connection providers lack shared goals. The integration of utility partners into the development team facilitates innovative utility arrangements, not just for supplies. For example. the choice of selecting a multi-utility partner from the range of partnerships now available means that a single provider can deliver combined heat and power systems as part of the utility network. This can be the case for even the largest and most complex developments. What has traditionally been the “last mile” for networks, for incoming services, is also becoming the “first mile” for the generation of heating, cooling, and power.

As barriers to competition have reduced independent network providers have built a substantial market presence. In 2019 more than 300,000 gas and electricity connections were provided by independents. Set in context **the additional 159,000 gas connections provided by independents was three times the size of the total growth in gas connections, and 150,000 independent electricity connections was 130% of the year’s total increase in electricity connections**. **It is clear that independents competing with each other now dominate the markets for new network connections, including some of the UKs most iconic new developments such as Media City, Kings Cross, and Battersea Power Station.**

Independent Gas Transporters now serve more than 2.3 million UK users; a million more than in 2010. This makes them now of roughly equivalent scale in terms of connections to either Wales and West Utilities or Northern Gas Networks, with more than 10% of all new and old connections. The market presence of Independent Distribution Network Operators for electricity connections grew ten-fold between 2010 and 2019, from 50,000 connections to 780,000.

Independent connection providers innovate in way that incumbents tend not to. This is because they are exposed to very different commercial and competitive pressures, as outlined above with a quite different commercial focus. An independent operator’s reward comes through efficiencies. To achieve this they may choose to work across multiple utilities. As a result some independents are increasingly developing true “multi-utility” propositions to include heat, water/sewerage and/or fibre. The immediate commercial benefit is that the developer (and the providers building the networks) receive a bundled offer, from a single point of contact, for the adoption of multiple utilities on the same site. This produces obvious operational benefits by unifying quotation, design approval, land acquisition and commissioning processes across multiple utilities. It can also produce a commercial benefit in that adopters can consider offering a “package” asset value to reflect the overall economics of the scheme.

The longer-term societal benefit is that increasing visibility and control across multiple utilities allows independents to take a “whole system” view. The specification of an individual network is unlikely to be materially different from an incumbent design because of industry-wide engineering and regulatory standards. But a “whole system” view allows independents to innovate more easily across multiple utilities at the site level. So gas and power networks, for example, can be designed to facilitate low carbon heating technologies such as district heating networks and heat pumps – critical enablers on most credible net zero pathways.

Independents have been able to adapt quickly to building needs and to individual customer requirements. They have been willing and able to add other utilities into their offer, and to innovate as core development partners.

The UK faces a significant housing shortage in the face of a growing population. The Government also has ambitious plans for rapid development, not only for new homes, but for hospitals and businesses. The coronavirus pandemic of 2020 has reinforced the urgency of these plans, because development has been given a central role in the recovery from the pandemic and in plans to improve ailing productivity levels after Brexit.

This paper explains the role that independent utility network providers and adopters are playing in facilitating rapid and innovative development. It is a sector that has been able to develop only slowly due to the dominance of the regional utilities, but by 2020 it has reached a scale where the independent option is both real, popular, and making a tangible difference in pursuit of local ambitions and national policy priorities.

In comparison to the volatility of many other market liberalisations the growth of competition in network connections has shown remarkable consistency, and the range of choices continues to increase. The uptake of independent options for utilities has represented a quiet revolution in development. It is difficult to bring to mind an industrial market that has been opened to competition, with few (if any) unintended consequences or controversies. The steady but strong growth in competition, and the innovations facilitated by it, appears to have kept this change from media headlines and policymakers' attention. Nevertheless, this review shows the central role that the choices now available play in the delivery of many policy priorities.

A low profile for this quiet revolution does raise the risk that this vibrant sector could become collateral damage in future policy reforms in the energy sector. The achievements of the past 20 years warrant much greater awareness.

3. A primer on Independent Networks

What is a network connection?

Every home, business or service needs a connection to the utilities available in their area. They will probably require connections to the national and regional services owned by one of the major underground network utilities: Electricity, gas, water, fibre communications and waste water disposal. Increasingly a development's own renewable energy generation activities may also feed supplies into the electricity network. For every development there will be a point at which these local services are connected to the mains. This may be immediately outside an individual property, or at a considerable distance dependent upon the location of the user and the existing mains for each utility. This extension to the existing network will often be an extensive network in itself, covering a large number of users with new connections and across one or more utilities.

Historically, the incumbent network operators enjoyed geographically exclusive areas of operation that mirrored the areas they were responsible for while state-owned. This is no longer the case outside of the water and sewerage sectors, in which primary legislation still requires "appointments" to be made on a geographically exclusive basis (which has resulted in very low penetration of independent operators in those sectors). In gas and electricity, incumbents are able to operate outside of these areas but the incentives to do so are weak.

This inertia is reinforced by the vast geographical reach of incumbents' existing networks: even if an independent operator is appointed to a development, the incumbent will be paid for connecting the new network extension to the existing pipes or wires, and for distributing the service (gas, electricity, water, signal) up to that connection point.

What are "independent networks"?

"independent network providers and adopters, which we will refer to simply as "independents" or "independent networks", are businesses licensed to construct and/or operate the network connections, independently from the monopoly regional or national utility companies, which we refer to as "incumbents".

In broad terms, there is a distinction amongst independents between businesses that design and build network extensions, and businesses that subsequently take over the ownership, operation and maintenance of the completed network.

The design and build businesses are called different things according to the industries in which they operate: for example, in gas they are referred to as "utility infrastructure providers" (UIP), in electricity as "independent connections providers" (ICP) and in water / sewerage as "self-lay organisations" (SLO). These are not legal terms but are conventionally applied only to businesses that hold the relevant accreditations from Lloyds Register, signifying that they are competent for the relevant activity.

To own, operate and maintain the completed network an organisation will also need to be licensed by the relevant regulatory body. For example, as an Independent Gas Transporter (IGT) or as an Independent Distribution Network Operator (IDNOs) for electricity. The emergence of these businesses over the past 20 years has done much to support the growth of the market for UIPs and ICPs, through their demand for an appropriate supply chain of construction partners.

In contrast to the incumbent network businesses, independent network operators start with no asset base whatsoever, and must compete in the open market to win the right to adopt new networks.

How much competition is there?

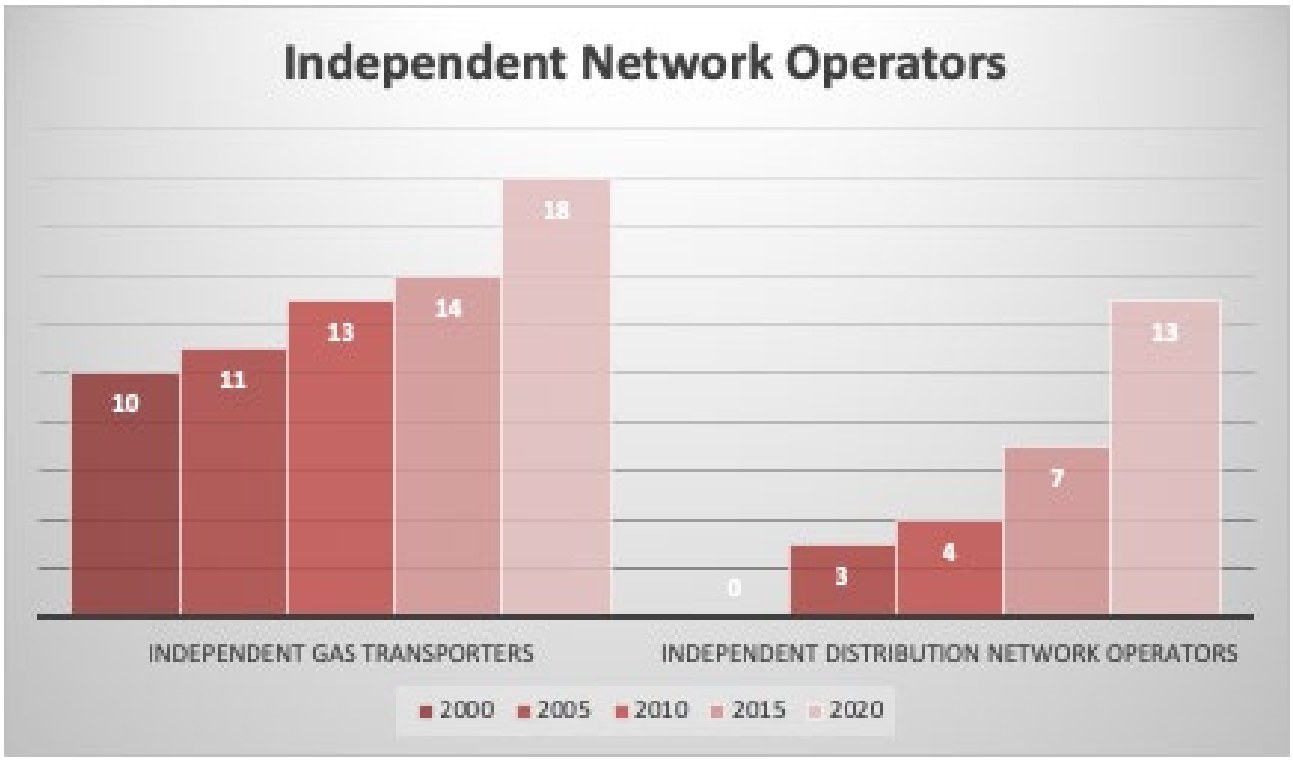
The regulatory demands are quite different between the design and build sector and the network operations sector, with the latter generally facing higher regulatory barriers to entry, although these vary between the utilities. As would be expected the number of competitors in the design and build sector has grown more rapidly than in network operation. The growth of the market has also been constrained by the independents' reliance on the incumbent 'upstream' operators, for the physical connections. There is an inherent and unavoidable conflict of interest, and it has taken some years and several regulatory interventions to develop sustainable regulatory solutions on the technical and commercial terms for independent networks.

For network construction

By 2020 there were 171 Utility Infrastructure Providers (UIPs) for gas[1], 299 Independent Connection Providers (ICPs)[2] for electricity, and 202 self-lay organisations/WIRSAE Providers for water[3]. Some 38 from amongst these are also accredited as Multi-Utility Recognition Status (MURS) providers[4].

For network adoption & operation

By 2020 there were 18 licensed independent gas transporters[5] and 13 independent distribution network operators for electricity[6][7]



How are they regulated?

With some exceptions, all gas and electricity network operators must be licensed by OFGEM, and water or sewerage operators are “appointed” by OFWAT. They must comply with industry-agreed standards and technical requirements set by the incumbent network operator for the area. This is needed in order to ensure that the incumbent will allow the essential connection to the upstream network.

The growth of competition in the construction of networks has been facilitated by the development of an independent accreditation system. This is managed by Lloyds Register[1]. Although accredition is voluntary, the fact that licensed network operators accept registration as a guarantee of competence means that use of an accredited contractor assists with speed of design and construction. Alongside the original accreditation of gas (GIRS) and electricity (NERS), the scheme now includes water (WIRS & WIRSAE), drinking water (DWIRMAS) and multi-utility accreditations (MURS). By 2020 the GIRS register had grown to include 171 companies, and NERS to 295[8].

How much does it cost?

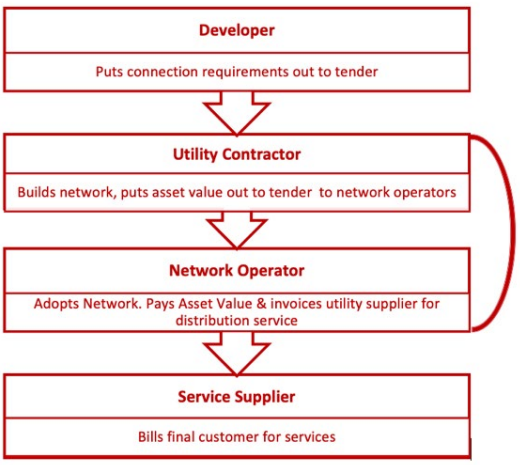
Using an independent network does not increase the prices to the end user of the utilities, which are capped, nor does it reduce their choice of supplier for each utility. The price regulation to which independents are subject in gas, electricity, water and sewerage[2] means that they can only increase revenue by adding more connections to their asset base, and by improving efficiency. Independents are therefore fully exposed to the competitive pressures of the adoption market and must innovate to win connections.

Decisions over other service choices (fibre broadband, telephone, television) remain a matter between the developer (or other landlord) and their tenants, and people tend to be more familiar with distribution network competition in these sectors than in other utilities.

The incumbent “upstream” network will receive a reduced payment for capital costs and services supplied through the network, and the independent will negotiate with the developer on an asset value payment for adoption of the network.

Who pays for the network?

The choice of a network installation partner is a commercial decision for the client, usually a developer. Independents compete for this business against the major utility networks’ construction businesses and against each other. These choices are not based solely on the reduced construction cost, but also the ease of working on issues of design approval and land rights etc., reputation, and speed. Utility connections are increasingly complex and tightly regulated, meaning that these are important decisions for a developer, and an experienced contractor will deal with the connection application to the incumbent network operator.



[1] *https://www.lr.org/en-gb/utilities/*

[2] *Heat networks are usually capped in a similar way but through a form of concession contract with the developer rather than regulatory intervention*

An independent will bid to adopt a network by offering a financial contribution (an “asset value payment”) to the installer (or to the developer if the independent is also the installer). The contribution thereby reduces capital costs for the developer and passes responsibility for the assets and the network connection to the independent.

Supporting the regional supply chain

“Working with an Independent Adoption business has allowed us to react more quickly to design changes from developers and to provide a tailored service which meets their needs. This level of service combined with competitive pricing has allowed us to win more sites and grow our business. They have provided excellent support for us during lockdown, accelerating payments to ensure we could bring teams back from furlough promptly and get them back in the field connecting new homes.”

Tim Kilroe, Bethell, Civils & Utilities, Greater Manchester

4. Speed, choice, and innovation

In July 2020 the UK Prime Minister set out a coronavirus lockdown recovery strategy headlined: *"build, build, build"*. He argued that this rebuilding of the economy needed to be "stronger", "faster" and "greener" than before[9]. Whether homes, schools, or businesses all of these developments will need cost-effective and reliable connections for important utilities. They will need to meet the demands of achieving the statutory target of "net zero carbon" by 2050[10], of the housing crisis, and of the UK productivity challenge. This will require innovation and speed. Utility connections will be a core part of this change. They will need to ensure, for example, that:

- The need for multiple utility connections does not slow the pace of developments, nor undermine building cost efficiencies.
- Future changes in the energy mix are accommodated
- The shift from hydrocarbon to electric vehicles is supported, and the roll-out of smart metering.

Independent network providers are closing the competition gap in utility connections. Prior to the arrival of this competition in connections every development was reliant upon the legacy monopolies to lay their new network connections, often involving a separate provider for each utility; gas, electricity, water, waste-water and communications. Whilst the consumer had long been able to choose and change their service supplier, the developer had not been able to choose who lays and maintains the physical connection to the networks. The consequences of this competition gap were significant; adding to build-out delays and adding to development costs. In the traditional model of a single network monopoly there can be little common interest between the site owner and the connection provider.

Developers' Utility Partner Choices (2020)		
	Construction	**Adoption**
Gas	**171** Utility Infrastructure Providers	**18** Independent Gas Transporters (plus the Gas Distribution Network Operator)
Electricity	**299** Independent Connections Providers	**13** Independent Distribution Network Operators (plus the DNO)
Water	**202** Self-Lay Operators/WIRSAE firms	**9** "New Appointees" plus the local monopoly
Multi-Utility*	**38** Multi Utility Recognition Status providers	**6** businesses with IGT & IDNO licences
Sources: OFGEM, OFWAT		

The competition offered by independent network providers has represented a complete transformation of the incentive mechanism. Whereas connections were simply a source of operational synergy for network operators, wholly focused on their own supply-side interests, competition has seen investment incentives develop that are focused on customer demands. New providers, unable to reap returns from the whole network, are being incentivised by the potential to gain value from only the connection assets laid. The connection itself becomes the priority. Whilst the absolute value of the connection is either unchanged or reduced (through efficiency), the relative value is much higher in the business model of an independent connection provider.

The emergence of independent providers for these local network connections since 2000 has been giving developers real choice over *who* provides these physical connections to their chosen providers. The relationship between a developer and their utility connections is transforming from a simple contract to install hardware, to a relationship based on a mutual interest in securing connection efficiency. The regulation of prices and standards circumscribe this relationship, ensuring that competition is based on efficiency and

customer service. Whilst the connection may be of limited commercial interest to the regional network provider, it is paramount interest to an independent provider.

The local connection may be an important link in the complex chain of utility competition, from generator to the end user. After a very slow start, particularly in electricity connections, competition is now making a real difference to speed, costs, and innovation. The fact that the rise of independent connections has been sustained over two decades demonstrates a market need that was not going to be fulfilled by the mere "contestability"[11] of the connections market: It now seems clear that the new perspective provided by independent providers has been something that developers have valued when it is available, and which the market incumbent have often been unable or unwilling to match once barriers to entry have been lowered. As choice and competition has developed, so has the range of options available. Many independent network providers will offer the choice of a "one stop shop" for all utility connections. Developers have the choice of one firm taking responsibility for all their utility connections: Gas, electricity, fibre, water supply and wastewater removal, and a choice of any sub-set of these.

This paper explains the background to the growth in independent network connections since the turn of the millennium, the difference this makes in practice, the policy changes that have been enabling competition and innovation, and the sector's role in helping address today's most serious social, environmental and economic challenges.

"Duchy Homes uses independent multi utility companies rather than the traditional single utility monopolies. This offers us the most cost effective and efficient solution to bringing new utility connections to our construction sites. It is always our preference to have one company deliver all, or as many utilities as possible"

Lee Foxon, Duchy Homes

The paper was commissioned by the **Independent Networks Association**, representing the interests of the UK's independent owners and operators of utility infrastructure. These businesses typically:

- Own and facilitate the design, build operation and maintenance of multi-utility networks, including gas, electricity, water, wastewater, district and community heating, and fibre-optic communication networks.
- Focus on the "last mile" of networks which connect homes and businesses to existing upstream gas, water, electricity, and fibre-optic networks.
- Have decades of experience in this work, with strong links to the major national and regional housebuilders and developers

Key differences with the traditional regulated utilities lie in the focus on mostly new installations to the latest technical standards, and in the range of strategic choices across the range of network design, build, and adoption once in commission. By using an independent network provider they can now choose a single partner across all regions and countries of the UK. Furthermore, the selection of an independent network partner can also facilitate the use of a developer's own supply chain as part of the network development, whether they are a national, regional or locally-focused business. This level of self-determination can be expected to transform the relationship between develop and utility partner.

The options available from competitors in independent connections are significant, encompassing decisions over roles in the design of utility connections for a site, the construction of those connections, and thereafter whether to adopt the connections themselves (if licensed to do so) or use an adoption partner. They can choose an option from this menu for a single development site, or across all of their sites. Adoption, of course, offers a long-term relationship, and offers new routes for capital funding based on the revenue stream from

utility throughput. Given these options it is fully possible that the network connections provider can be integrated into the development team from planning to completion. The traditional “gaps” between developers and their regional utility operator are closed.

5. Building Competition

The Quiet Revolution

Creating the conditions to promote competition in energy supply has taken considerable time and public policy effort, dating back to the 1980s. The Oil and Gas Enterprise Act of 1982 allowed the largest industrial users a choice of gas supplier by private pipelines, and those using 25,000 to 2 million therms a year to apply to the Secretary of State to use an alternative supplier via the British Gas Corporation's pipelines as a "common carrier:

The former Secretary of State for Energy (and later Chancellor), Nigel Lawson, explained:

"… Industrial companies were complaining that British gas was either overcharging them or failing to supply them at all on the grounds that there was a shortage of gas, this was both damaging and absurd".[12]

Similar "common carrier" provisions were included for electricity in the 1983 Energy Act[13]. At first the policy focus was on creating a choice of supplier, whether to retail or commercial customers. The continued dominance of the historic monopolies prompted a need for more extensive reform.

- **1986 Gas Act** enabled the privatisation of British Gas as a vertically-integrated business (including pipelines), created an independent economic regulator, and promoted competition in gas supply.
- **1989 Electricity Act** enabled the privatisation of the Central Electricity Generating Board as four companies, including the National Grid Company, and created an independent economic regulator.
- **1992 referral of British Gas to the Monopolies and Mergers Commission** led to a decision to separate the gas supply and transportation businesses, and a phased introduction of competition.
- **1995 Gas Act** created a system for the licensing of "public gas transporters"
- **1998 Competition Act** gave the Competition Commission new powers in energy markets.
- **2000 Utilities Act**[14] created new opportunities for competition in gas and electricity markets, including transportation, and created single regulator for gas and electricity markets, OFGEM.
- **2015 Competition in Connections OFGEM Code of Practice** created an adaptive code to facilitate competition in electricity connections. It placed an obligation on incumbents to provide customers with competitor information.
- **2018 OFWAT Charging Rules for New Connection Services**[15] came into force in England setting clear principles for incumbent water company charges imposed on "new appointees" providing network services.

Part of the premise of the Utilities Act (2000) was that competition would be used wherever possible, reducing the need for regulation. This was based on the government's belief that the privatised utilities were: *"sold as monopolies, with no provision for additional competition, making it difficult for new entrants to enter the market."*[16]

A broadly comparative measure for telecoms, to facilitate competition to British Telecommunications (BT) on the final link into customers' premises, known as "local loop unbundling", was implemented in 2000. According to the OECD this additional measure proved necessary because of the practical and economic difficulty of replicating the incumbent's local loop connections. Telecommunications were liberalised in 1984, but new entrants' share of residential lines was still only 19% almost 20 years later[17]. Around the same time OFCOM noted that: *"Much of the access infrastructure for corporate consumers is provided by BT on a wholesale basis to these new alternative providers".*[18] More recently regulators have sought to use network competition wherever possible to support the transition from copper to fibre lines.[19] In 2019 OFCOM noted that, even in competitive areas: *"… while in theory it is profitable for BT's rivals to dig short distances to connect new*

customers, in practice they rarely do so. We find that it is only in the CLA [Central London Area] market that rivals use their own network to a large extent."[20]

In 2000 OFGEM conducted a survey of competition in gas and electricity connections. Whilst the survey found competition in the provision of gas connections to new housing developments and high value business sites it revealed that: *"electricity connections are provided almost exclusively by the host Public Electricity Supplier (PES) distribution businesses operating within their authorised areas"*. It noted that: *"The principal barriers preventing the development of effective competition relate to the policies and procedures adopted by each PES distribution business in dealing with other providers of connection services"*.[21] The level of competition in connections showed great variability between electricity distribution areas when OFGEM last published its annual review of the connections industry (2010-11); now more than a decade old. In the period since 2010 OFGEM undertook a review of electricity connections, which had proven to be particularly complex,[22] and over the decade independent providers have come to dominate the connections market.

More recently, Dieter Helm's Cost of Energy Review for the government Dieter Helm proposed further reform, to tackle issues of: *"legacy costs, policies and regulation, and the continued exercise of market power"*.[23] Helm argued that:

> *"Considerable importance is now placed on network efficiency and innovation. OFGEM says that one of its key objectives as a regulator is: "to ensure that network companies support the transition to a smarter, more flexible, sustainable and lower-carbon energy system …*
>
> *"As the growth in electric vehicles accelerates and more homes and businesses source their heat and power from cleaner energy sources, a core responsibility of networks will be to facilitate these changes. This means responding to the demands for low carbon connections in a timely way, finding efficient ways to respond to new sources of demand and flexibility on the networks, supporting innovation that could expand the range of possibilities for the decarbonisation of heat, power and transport".*[24]

As will be shown in this paper, this is what the independent sector is now delivering, at scale across the UK, in priority areas for housing and economic regeneration. It has does so without the need for further reform of market arrangements, with the substantial risks and uncertainties that these would entail. Indeed, there is a very real risk that further market reform could undermine what has been achieved without careful attention to the central role of independents in the connections market.

Meanwhile government has continued to take steps to liberalise the market wherever possible, announcing in 2017 that the National Grid would have to give its own system operator role greater independence as a tangible demonstration of a commitment to benefits of competition, making it better able to work with distribution network operators in managing electricity flows. The Secretary of State, Greg Clark, said:

"Separating our system operator will give greater confidence to investors that Great Britain offers a level playing field for companies wanting to be part of our clean, secure and flexible energy system – keeping costs as low as possible for homes and businesses".[25]

The National Grid Electricity System Operation, known as "NationalGridESO" became a legally separate business within the National Grid Group on 1st April 2019[26], bringing improved transparency to support a culture of market competition and choice. In an update of "Competition in Connections" that year the Energy Networks Association (ENA) noted that:

"The market for the provision of electricity connections to the DNO's Distribution System has evolved over the last 15 years, from a time where such connections could only be provided by the DNO to a market where other providers other than the DNO can undertake many of the Connection Works in competition with the DNO".[27]

Current Market Structure

The British electricity market was historicially separated within England and Wales into 12 authorised regions, each served by a single Distribution Network Operator, with an additional two regions in Scotland. They own and operate the distribution system in their area. Whilst they are now free to operate outside of these areas, each retains obligations in terms of universal services within their "distribution services area" (DSA). There are four Gas Network Operators, covering much larger areas. These too are not legally constrained to operate only within their historic area, but are free to compete for other network contracts under their licences.

In 2020 OFGEM valued the electricity connections market at £500m a year, adding that: *"The installation of new connection assets helps to minimise natural monopolies"*[28], noting that: *Following its introduction in 2000, the development of competition for electricity connections has been slow compared to gas. Because of this we developed measures in the Distribution Price Control Review 5 to improve conditions for competition. Collectively these measures are referred to as the "competition test process".*

Following a review during 2014-15 OFGEM decided to harmonise arrangements for competition in connections, with an enforceable Code of Practice, designed to reduce the capacity of DNOs to frustrate competition.[29]

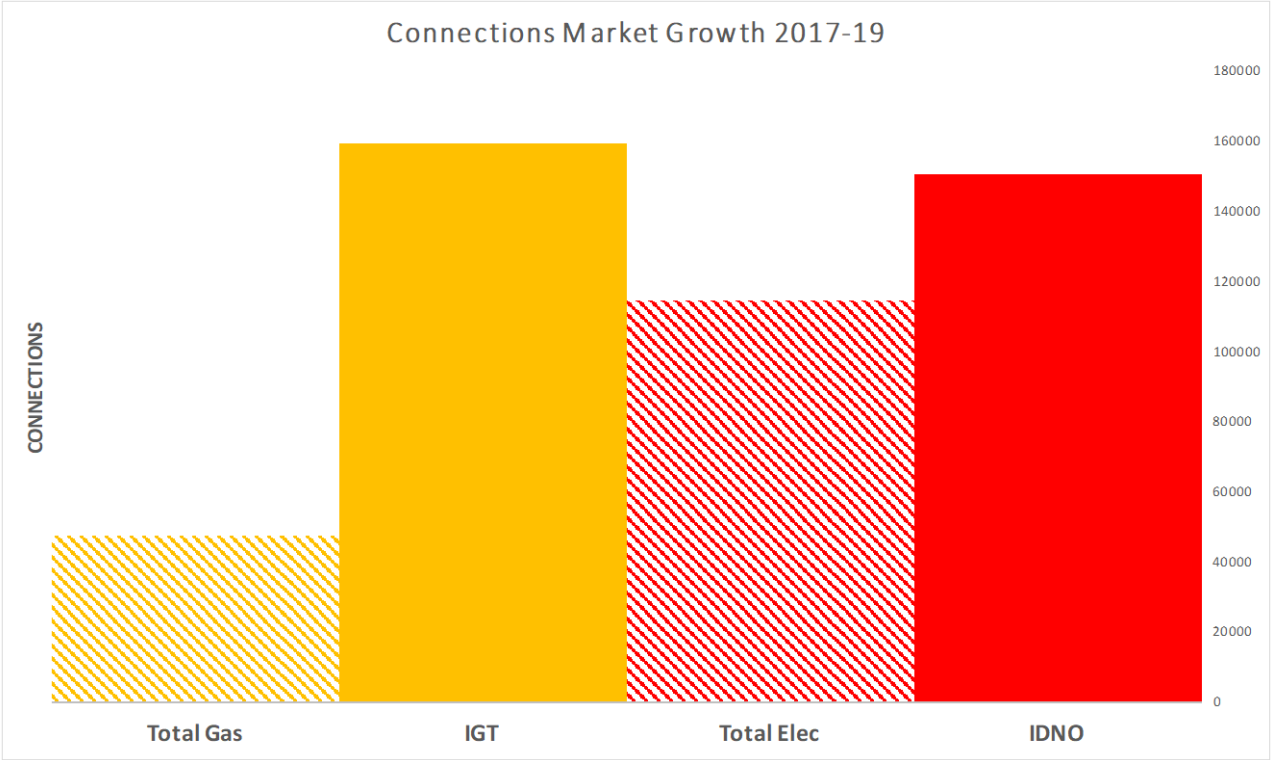
Independent Gas Transporters

By 2019 10.5% of 21.9 million gas connections had been provided by IGTs (2.3 million)[30]. In 2018-19 alone the number of connections installed by IGTs increased 20% year-on-year, to nearly 160,000.

The OFGEM website notes that: *"Historically, competition in the gas connections market is stronger than in the electricity connections market. Over half of new and modified gas connections are carried out by non GDNs".*[31]

Independent Distribution Network Operators (Electricity)

Whilst the 2019 total of 2.6% (782,000) IDNO connections may seem a small share of the UK's 29.7 million electricity connections, this is mostly due to the historic legacy of monopoly connections. This evidently does not reflect choices made in the current market for connections. In 2018-19 alone the number of new connections installed by IDNOs increased 28% year-on-year to more than 150,000, much faster than growth in the number of UK connections.



The first Independent Gas Transporter licences were awarded in 1996, and the number of competitors has grown steadily since then. The first three Independent Distribution Network Operator licences for electricity were awarded in 2004. There has been a similar rate of ongoing growth since then. A notable feature of the development of competition in these markets, in comparison to many other market liberalisations, has been the stability of the new entrants and of the growth in their combined market share. In many other cases of market liberalisation new entrants there has been a sudden spike of competition followed by renewed market concentration and a decline in product differentiation[32]. In the case of utility connections not only has the scale of competition continued to grow since liberalisation, over a period that now spans almost a quarter-century for gas connections, but also the scope of competition: The range of offerings is still expanding, as firms adapt to customer demands. The available choices now span multiple utilities including fibre and renewables; the full range of partnership options across the design, build, and ultimate ownership of the connections; and offerings to both new-build developers and "infill" connections to existing sites that previously lacked connections.

Infill Connections: Connecting Gas to Stranraer

Competition has not only benefitted new developments. Homes and businesses that have long been "off grid" because the regulated monopolies were unwilling or unable to provide infill connections have seen independent network providers deliver their connections. One example was the delivery of affordable gas connections to the homes of Stranraer, after the Gas Network Operation (GNO) Transco was criticised for the high prices quoted to homeowners in the area, and subsequently objected to proposals from the new competitor.

6. New Solutions to Old Problems

The slow recovery from the economic crash of 2008 and the 2016 vote for the UK to leave the European Union led to a renewed focus on industrial strategy, and the "productivity problem". The productivity concern is of particular relevance to the construction sector, which saw declining productivity in the decade to 2018, and levels of productivity consistently below those of the wider economy. In 2008-2018 output per hour declined 10.1% in civil engineering and 5.6% in construction of buildings[33]. The Farmer Review of 2016[34], entitled "Modernise or Die" highlighted poor collaboration within the sector as one of the major causes of poor productivity.

The onset of the coronavirus pandemic in March 2020 was tackled by lockdown policies that produced the most rapid economic decline of modern times. In the single month of April 2020 GDP fell by 20.4%. This was three times greater than the fall during the 2008 to 2009 downturn, when GDP fell 6.9% over a 13-month period. More than 42% of construction businesses reported zero turnover in April 2020[35] [3], although the sector saw a significant bounce back in June, once the lockdown on activity was eased. By the end of July 2020 the sector's output was just 11.6% below the pre-pandemic level of February 2020. Notably, however, the construction of new private housing was the biggest contributor to the fall in new work over the May to July quarter[36].

Communications, Choice & Costs

A report from the British Property Federation in 2011 argued that, at that time:

*"**Organising utility connections is often cited as the single most common cause of delay in construction projects**. Whilst construction times have been growing shorter because of improved technology and greater efficiency, the connections industry has failed to keep pace. Delays are not just a problem for property developers. The have wider economic impacts such a delaying the speed at which new retail businesses can open their doors or slowing the supply of new homes to the market. Whilst the main concern*

[3] The 42% is probably an underestimate of construction firm zero activity, as the response rate to the ONS survey also fell, probably due to the number of staff who were furloughed under the government Coronavirus Job Retention Scheme

revolves around delays in getting connected, the cost and complexity of the connection process are contributory issues".[37]

Back in 2014 the government and regulators published a *"Better Connected"* practical guide for developers. The Minister for Housing and Planning wrote:

*"To build the homes we need and deliver the local growth and jobs to go with them, we must make sure the right utility infrastructure is in place to enable developments to connect in a timely and cost-effective manner … **We want to enable growth by ensuring utilities are in the right location, at the right time and at the right cost"***[38]

This renewed priority on connections was welcomed at the time by the Home Builders Federation (HBF). Its Technical Director said: "*HBF welcomes the better connected publication from DCLG and its recognition of the importance of efficient, customer focused utilities provision for future housing supply."*[39]

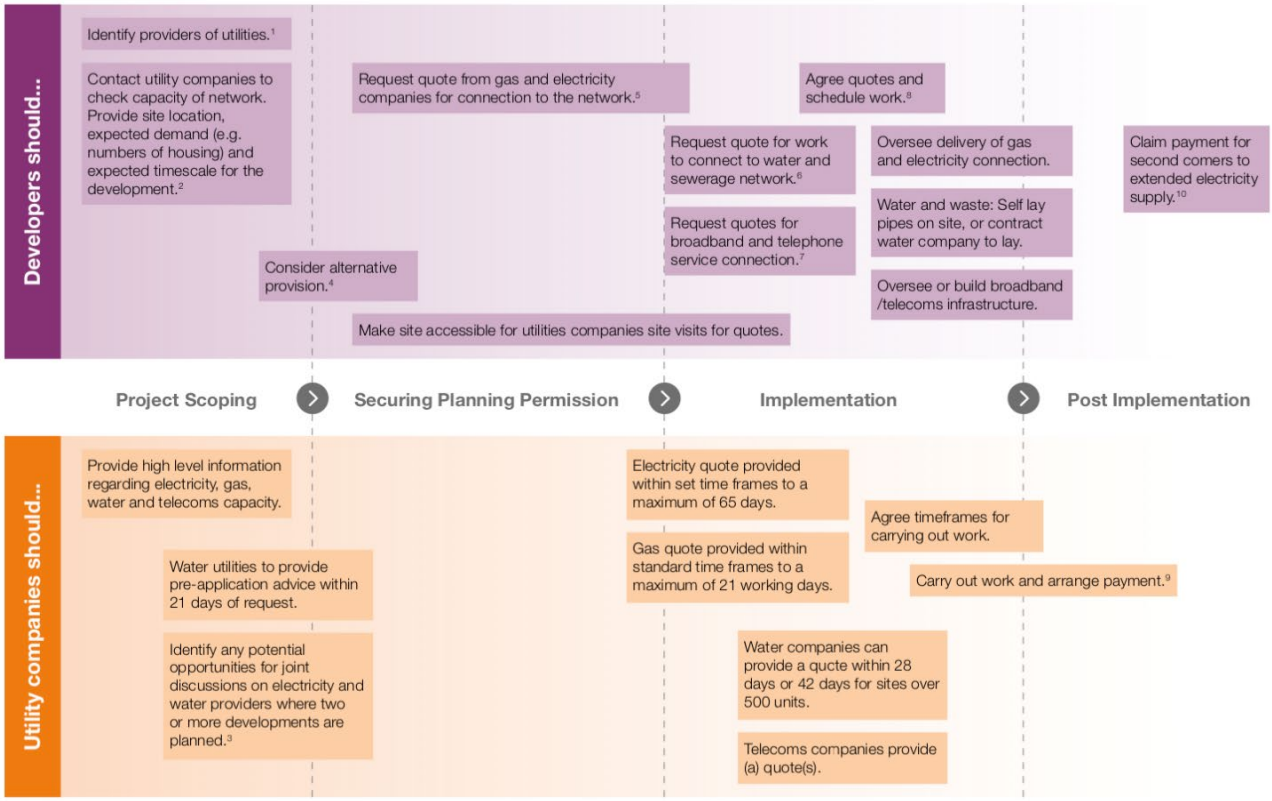


Figure 1: Utilities in the Development Process © Crown Copyright "Better Connected" (2014)

By the time of its publication, however, "Better Connected" was already behind the pace of competition in connections and the uptake of independent offerings. Whilst the document attempted to tackle the issue of delays, the options available to developers had already moved on from this basic concern to connections that were not only faster than in the past, but also much more flexible in the options available.

The assumption underlying the development of competition over the past 20 years has been that competition will spur innovation, improving customer service and efficiency. Wherever a sector could be made contestable this should be done, retaining monopolies only where essential. These questions are not static. Technological advance itself, can transform an activity from a natural monopoly to a contestable market. Changing financial models can also transform the competition landscape, transforming past "sunk cost" investments into assets able to produce revenue streams. In this section we consider some of the innovations that have created new

opportunities in local connections, and the experience of other regulated industries in which competition has already developed.

Competition and Choice

The independent network option for gas and electricity has been available to developers for more than 20 years. Both the scale and breadth of choice available, and the level of competition, have grown. Developers operating throughout Great Britain now have the option of:

- Selecting a single network connection provider for all their developments or a different partner for each
- A network connection provided for each utility, or for all utility connections
- Choosing innovative approaches to connections, instead of single regional standards
- Choosing a partner for each or all parts of the design-build-adopt roles in utility connections

Persimmon Homes

"Persimmon Essex now sources all its utility connections on new housing developments from the independent sector. These operators provide a more focused and efficient service to our development sites, ensuring that utility connections are made on time and on budget … Independents have also brought significant innovation both in the delivery of utility connections and in the range of services they offer – increasingly we are sourcing gas, electricity water and waste water from a single provider"

Luke Atkinson - Technical Director

Innovation should be no surprise. In other sectors in which competition has been introduced in network markets dominated by traditional suppliers, innovation has produced entirely new opportunities as well as cost reduction. Prior to the air transport liberalisation packages of the 1990s low cost air travel was limited largely to package holidays. Bold attempts to compete directly with the legacy, and often state-subsidised airlines were usually short-lived. The application of competition rules to airline and airport pricing and to the allocation of landing slots at the most attractive airports was transformative.

New air carriers were able to compete in these contestable point-to-point travel markets without needing the replicate the full network of the legacy businesses. Operating costs reduced, ticket restrictions designed to limit access to lower fares disappeared, and whole new routes became available. The legacy airlines still dominate the global network market, albeit on more competitive terms, but new entry has transformed the range of options available to users and produced real innovation. Travellers have more routes available to them, more flight frequencies, a wider range of prices, and fewer fare restrictions. Pricing has largely transformed from a situation in which those who planned ahead paid most, and cheap fares were for anyone willing to risk a last minute "stand-by" for empty seats, to one that rewards advance planning by the cost-conscious, and leaving "add on" costs to consumer choice.

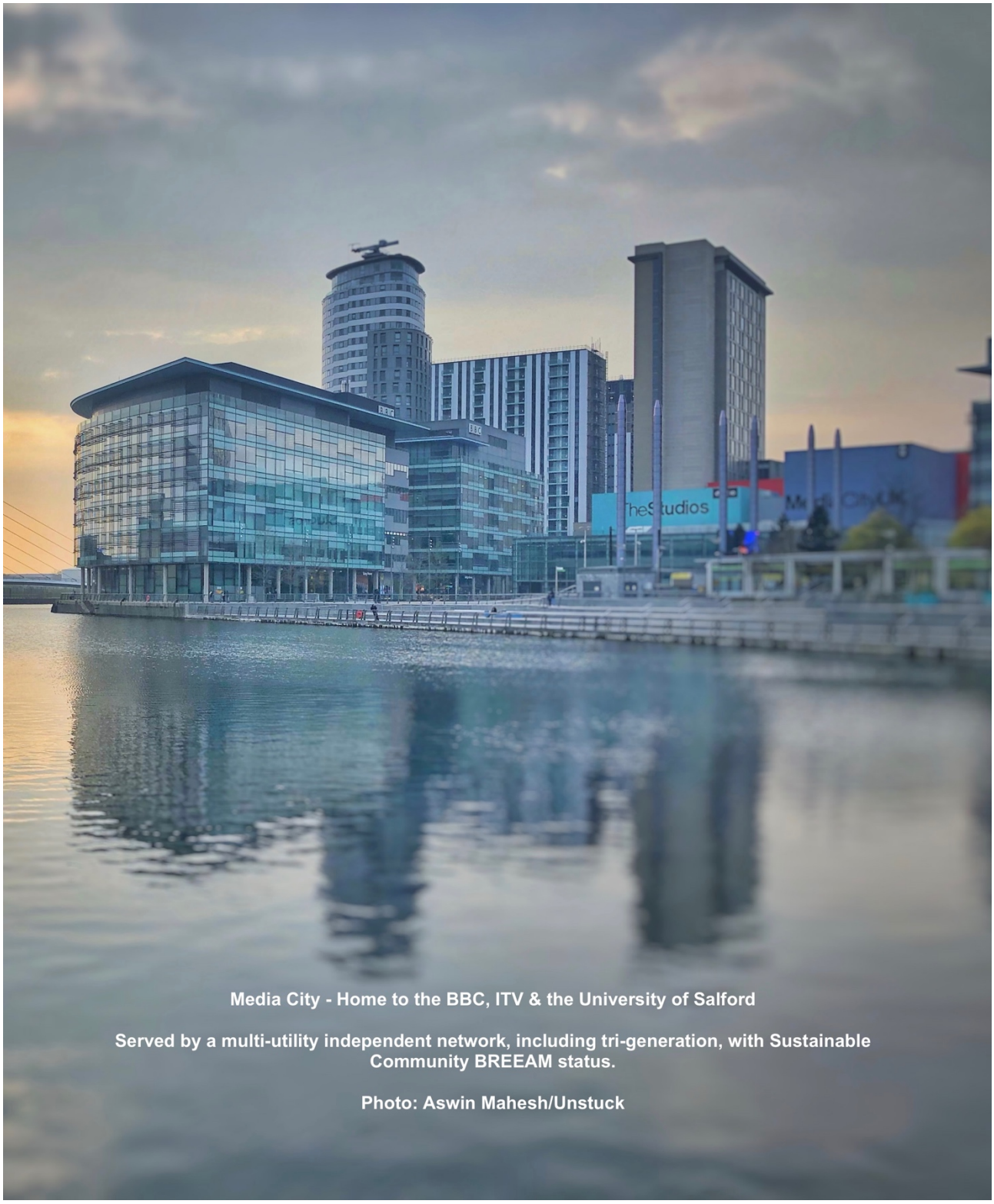
In utility connections before competition developers were also largely supplicants to the regional network operators. Today they can be consumers, with real choices.

Old Problems, New Solutions

At the new garden suburb for Maldon, Essex the developer Taylor Wimpey faced the challenge of overcoming a particularly complicated situation for waste water from this site including 606 new homes due to the limited capacity of the existing sewerage network. By choosing an independent network provider for all its utilities, however, the company had an expert partner in negotiating a solution with Anglian Water. By offering to install a waste storage facility on the site, Anglian Water agreed to pay for and adopt the pumping station. This saved Taylor Wimpey around £3m. It also avoided the huge disruption that would have resulted from structural reinforcements to the existing sewerage network.

Competition has also created opportunities for new small and medium-sized network businesses around the UK, as well as opportunities in the supply chain serving these. Accredited network contractors and a network adoption business can work easily together to tackle challenges along the design, construction, and network adoption pathway.

These benefits to regional economies and skilled jobs from the rise of independents in the utilities sector should be an important factor in the agenda to “level up” in the UK. Not only through the capacity to facilitate and speed the developments themselves, but also to contribute directly to local economies through the the independents’ own growth but also through their needs for a local supply chain with a similar commitment to efficiency and innovation.



Media City - Home to the BBC, ITV & the University of Salford

Served by a multi-utility independent network, including tri-generation, with Sustainable Community BREEAM status.

Photo: Aswin Mahesh/Unstuck

7. Achieving Policy Priorities

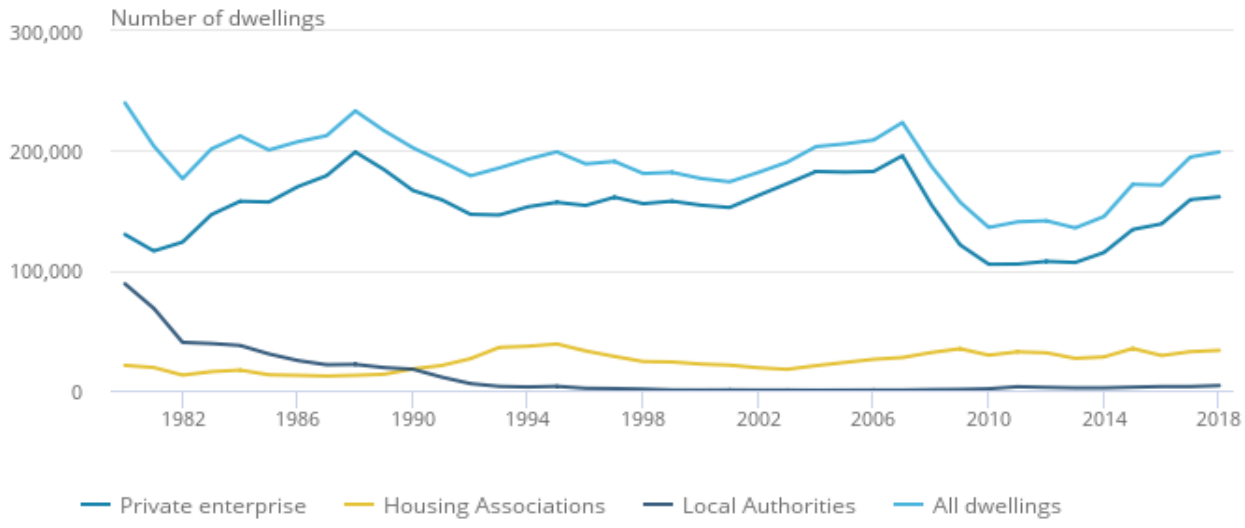
Project Speed

The number of households[4] in England is forecast to grow by 1.6 million (7.1%) in the 10 years to 2028, and to continue at a similar rate through the following decade. This is largely due to the ageing of the population[40]. It has been estimated that there is a need for 345,000 new homes to be built every year to 2031, including 145,000 affordable homes[41]. This is well above the level of housebuilding achieved over recent years: Net additional dwellings in England reached 241,340 in 2018-19, including 213,860 new build homes and almost 30,000 conversion of previously non-residential buildings.[42]

New Home Completions[43]

Figure 17: Growth in number of permanent new dwelling completions

Number of permanent new dwelling completions by tenure, UK, 1980 to 2018



Source: : Ministry of Housing, Communities and Local Government – Table 211

In June 2020 the Prime Minister made housing development a central feature of plans for recovery from the coronavirus lockdown". He spoke of:

> *"Decade after decade in which we failed to build enough homes" saying that "We will build fantastic new homes on brownfield sites … Yes we will insist on beautiful and low carbon homes, but COVID has taught us the cost of delay. Why does UK public procurements take 50 percent longer than in*

[4] *It should be noted that the number of households forecast is not a forecast of the number of homes needed.*

Germany? Why are UK capital costs typically between 10 and 30 per cent higher than other European projects? … Why are we slower at building homes by comparison with other European countries?

"In 2018 we built 2.25 homes per 100,000 people. Germany managed 3.6, the Netherlands 3.8, France 6.8. I tell you why, because time is money…"[44]

The Letwin Review of Build-Out rates, which reported in 2018, investigated utility installations as a problem for development speed. Whilst, by 2018, utilities were no longer a major cause of delays, it was clear that they remained problematic. The review's site visits revealed that:

"The house builders that we have met on the large sites studied have repeatedly complained about the impediments caused by slow responses from utility companies"

The review appeared blind to the choices now available to developers to circumvent these problems. The utility companies blamed the developers for *"insufficient clarity, co-ordination, and notice"*. In response to this passing of responsibility the review noted:

"Discussions with the utility regulators made clear that some of the reason for this conflict of views probably arises from the difficulty of distinguishing between infrastructure that will be paid for by utility customers, and infrastructure that needs to be paid for by housebuilders and developers; it also became apparent there remains some lack of clarity about the point at which a utility regulator will recognise a development as being sufficiently certain to permit assets constructed in relation to that development to be added to the regulatory asset base of the relevant utility. We also heard on some sites that there can be very different views between local and national levels within the utility companies"

In an attempt to bring clarity to this confusion of responsibilities the Review called for a government taskforce:

"to address the provision of utility infrastructure for large sites at a pace that permits development on those sites to commence faster than at present".[45]

It is, perhaps, symptomatic of the steady and uncontroversial growth of the independent networks sector and of the diverse range of choices now on offer, that the Letwin Review failed to note the dramatic change that had taken place over the previous two decades; a very different relationship is achieved between developers and independent network providers, when both are focused on the single delivery goal, often with an independent partner taking ownership of the utility assets on completion.

Meeting new needs, fast

Businesses too are experiencing rapid change as technology and consumer habits shift. In January 2020 an IDNO was awarded the electricity connections contract for a rapidly expanding business offering flexible kitchen space for rent, in part to meet the rapid growth in the uptake of food delivery apps.

Due to the utility network choices now available it was possible for the business to award a contract to a single IDNO for developments across four major UK cities, so that the first could be energised within just three months.

The omission of independent networks from the Letwin Review, which was presumably unintentional, highlights a need for the competitive landscape of utility connections to be made more visible to policymakers.

In 2020 government plans to ensure a full recovery from the 2020 pandemic included the creation of a national Infrastructure Delivery Taskforce, entitled "Project Speed". The stated aim was to:

> *"cut down the time it takes to develop, design and deliver vital infrastructure projects"*.

Plans included 40 new NHS hospitals, school rebuilding, investment in "giga-factories", new manufacturing and industry clusters, and investment in "shovel ready" local growth projects[46].

In August 2020 the Government announced plans[47] to make major changes to the planning process, as an attempt to further reduce delays to new developments. The consultation paper argued not only that the planning system delays and constrains necessary development, but that it also limits competition amongst developers. The Prime Minister argued:

> *"… let's take bold steps so that we in this country can finally build the homes we all need and the future we want to see"*[48]

The Secretary of State for Housing, Communities and Local Government said of the planning proposals:

> *"They aim to facilitate a more diverse and competitive housing industry, in which smaller builders can thrive alongside the big players …"*[49]

This followed several decades in which concentration in the housebuilding market has increased: In 1988 smaller housebuilders (producing less than 100 units a year) were constructing 40% of all completions in Britain. In 2014 their share was 12%[50]. Given an apparent association between smaller sites and faster build-out rates, the possibility that smaller firms may be more willing to develop on smaller plots of available land (thus increasing overall supply), and the importance of smaller firms outside the south-east of England policy attention on market concentration is inevitable.

Independent network firms can play an important part in supporting competition throughout the housing supply chain, whether in their own use of contractors for installations, bringing expertise in utility connections into the construction team (particularly valuable on constrained sites), or easing the operational burden by offering a single point of contact for all utility connections. In September 2020 the Housing Minister described a reduction in market concentration as one of the "key missions"[51] of the August 2020 White Paper on planning[52].

Quality at Scale & Speed

At Wood Wharf, Canary Wharf, London it was originally estimated that the 3,300 apartments and 32 commercial premises would take 6 years to build out. Within 2 years it was already 50% complete, much faster than expected. An independent connection provider (ICP) has been able to take control of the whole electricity network on behalf of the independent network operator. On site daily there has been no need for the usual request-response delay as requirements change.

This is the same model as being used for the redevelopment of Battersea Power Station.

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Innovation

Homes need to be built faster and at reducing cost, but they must also be built to meet the latest environmental standards. The National Housing Federation has been supporting a "Building Better" alliance of housing associations, seeking to use modern methods of construction (MMC), particularly offsite techniques, to achieve these multiple goals. The target is:

"to complete homes 50% faster than with traditional building methods".[53]

The Farmer Review highlighted a general resistance to innovation in the construction sector and argued for strategic use of:

> *"the connection between institutional finance in the residential sector and the investment needed to pump prime a new manufacture led construction sector"*[54].

The first ambition of the government's "Construction Sector deal" in its Industrial Strategy was to deliver:

> *"Better performing buildings that are built more quickly and at lower cost".*[55]

In 2020 the world marvelled at the Chinese ability to build a 1000-bed hospital in 10 days in response to the coronavirus outbreak in Wuhan (In fact, a similar feat had been accomplished during the SARS outbreak in Beijing seventeen years earlier). The Chinese used prefabricated units to construct a fully-operational facility, complete with 30 intensive care units, in such a short timescale[56]. Meeting ambitious build targets requires very different ways of working, and adaptability to Modern Methods of Construction (MMC), particularly modular structures built off-site. These would, of course, also have bespoke needs for utility connections, installed on time and exactly to the site's specifications. The August 2020 UK government white paper set out a wish to:

> *"support innovative developers and housebuilders, including small and medium-sized enterprises and self-builders, those looking to build a diverse range of types and tenures of housing, and those using modern methods of construction (MMC)"*[57]

For similar reasons, a group of housing associations came together during the 2020 pandemic to work with offsite manufacturers to demand a programme of "Homes for Heroes", to build 100,000 affordable homes for essential workers[58].

Savills predict that the UK will be Europe's strongest growth market for MMC during the 2020s:

> *"The country's construction workforce is ageing (a quarter are expected to retire in the next decade), annual housing delivery needs to increase by 24% per annum to meet need, and regulatory changes around energy efficiency are on the horizon. These will lead to increased adoption over the next decade and we expect that the proportion of housing built using MMC will rise from around 10% today to closer to 20% by 2030".*[59]

Policy ambitions have shifted significantly in recent years, from relatively standardised housing development on new greenfield sites, often out-of-town, to more innovative designs re-using brownfield, often urban, sites. This shift seems widely supported, despite the additional complexity of development in brownfield and urban sites, not least in terms of utility connections (Build out for greenfield sites may be 34% greater than brownfield[60]). In September 2020 the Housing Minister wrote:

> *"We want development to be directed to existing urban areas and level up our towns and cities with imaginative urban renewal. This makes sense when you consider that 76 per cent of local housing need is in council areas classified by the Office for National Statistics as urban".*[61]

The government's Commission argued against a "short-term, site-by-site approach, and called for more complex, but more attractive, "stewardship" approach to development: "Change the model of development from building 'units' to "making places". It argued that a key part of the challenge would be to transform relationships in the development team:

"…we do need to recast the relationship between client, professionals and contractors to ensure more collaborative outcomes with a request, given the move to off-site manufacture and new methods of construction, to revisit Sir Michael Latham's 1994 Report "Constructing the Team" to reflect how we can build better as well as more beautifully.

"Ensuring procurement isn't limiting to only big firms. Many 'pass or fail' procurement exercises result in the same large companies being selected. The sheer work required to apply, the high risk and the need to demonstrate a track record all mitigate against innovation or new entrants".[62]

Improved collaboration between all parties in a development. Research into the feasibility of growth in offsite construction methods for housing found that, alongside manufacturing capacity and skills shortages, *"unfavourable organizational factors are described as one of the main barriers to offsite construction adoption in the United Kingdom … Offsite construction requires a radical change in the conventional approach to project delivery and calls for an increased level of integration between design, building component supply, logistics, and building construction. In addition, the adoption of offsite construction techniques requires an increased investment in the project planning stage, early commitment, and early engagement of all the stakeholders involved in the design and construction process. However, these key factors tend to conflict with the fragmented nature of the construction industry and its supply chain".*[63]

The independent connections sector is providing a practical demonstration of the benefits of a more open, competitive and collaborative development model; able to deliver both innovation and value, despite rising complexity in sites and designs. This adaptability and the range of choices available to developers in relation to the delivery and ownership of utility networks will be of increasing importance as MMC expands.

New Hospitals

The Conservative manifesto at the 2019 General Election pledged to fund and build 40 new hospitals over the following 10 years. This had been set out shortly before in the government's Health Infrastructure Plan[64], with initial funding of £2.8 billion for 6 new hospitals, plus "seed funding" for a further 21 schemes. The Health Secretary described this as: *"the biggest, boldest, hospital-building programme in a generation".*[65] At the same time, however, the Department for Health and Social Care made it clear that hospitals would be required to exercise strict discipline in the delivery of capital projects. The plan promised: *"A revised approach to delivery and accountability, to ensure that funding is reaching the frontline as soon and efficiently as possible".*[66]

The £500 million development around Addenbrooke's hospital spanned 269 acres south of Cambridge. It was to host a 2.3 million sq.ft Cambridge Biomedical Campus, including the new Royal Papworth Hospital, which opened to patients on 1st May 2019. Additionally, the development provides an extra 2600 private and social homes[67].

"Selecting the right utilities infrastructure partner to work with on such a high profile and important development for Cambridge and Addenbrooke's Hospital was critical to our success"

John Rowbotham, Head of Strategic Land, Countryside Properties

The promised new hospitals will be inevitably complex builds, and as in the Addenbrooke's case there is a strong probability that they will be within mixed developments. They will, of course, need to be constructed quickly, given the political imperative, and to increasingly demanding environmental standards. The Chair of the NHS Sustainability Task Force, Nick Watts, has expressed a belief that the health service will be able to achieve net zero carbon emissions "well before" the statutory deadline of 2050. NHS England set out to develop a Net Zero Hospital Carbon Standard by March 2021, so that: *"all the 40 new hospitals will be built to net zero carbon standards"*.[68] This is a significant ambition; the NHS generates 18% of UK emissions from non-domestic building stock, at a metered cost to the health service of more than £600m a year[69]. One estimate has suggested that if NHS trusts adopted distributed energy solutions and updated old energy technologies, annual savings of £260m could be realised[70].

Net Zero by 2050

Meeting the statutory target of net zero carbon emissions by 2050 will require a dramatic transformation of the energy sector. OFGEM's Decarbonisation Action Plan noted that just 5% of domestic heating came from low carbon sources in 2020, and that the use of electric vehicles would need to increase from 230,000 to 46 million by the deadline. The OFGEM Plan said: *"Given the need for new investment, it is imperative that we build an energy system that is as efficient as possible."*[71]

The desired growth in the shift from hydrocarbon vehicles to electric vehicles (EVs) is a major concern for the energy network. Without smart charging technology and appropriate consumer behaviour the risk to the

network is high, in both the short and long term. Such is the level of concern over system capacity that the government took legislative steps to mandate smart charging functionality in all non-public EV charging installations[72]. On the positive side the roll-out of smart charging for vehicles creates an opportunity for the storage of one-fifth of Britain's solar generation, for use when needed.[73]

In 2012 the government imposed a legal obligation on energy suppliers for the installation of smart meters by 2019, and this target has been repeatedly shifted back. Suppliers cited "customer engagement" as one of the primary causes of delay[74]. Yet, three-quarters of customers with smart meters installed by 2018 were satisfied, and surveys showed strong consumer demand. Nevertheless, the National Audit Office reported that: "most energy suppliers have found it difficult to arrange installations with consumers"[75].

To reach the net zero target the gas network will need to be transformed to accommodate hydrogen, biomass etc. According to the National Grid the system transformation required for net zero by 2050 will require 65% of homes to be using hydrogen for heating[76], and also for homes to be actively managing their own heating demand with storage systems and able to load-shift, between electricity and hydrogen for example, according to demands on the network. Securing this smart integrated heat and power system view of electricity, gas, heat and transport will need investment in digitalisation, data sharing and artificial intelligence systems. It also increases the complexity of development projects. Alongside the programme to replace the UK's iron gas mains, the scale (and potential costs) of the endeavour of decarbonisation is huge, hence the Committee on Climate Change has suggested a flexible approach on heat decarbonisation:

"It remains to be seen what the right balance between hydrogen and full electrification will be in the long term, but the aim should be to eliminate all direct use of hydrocarbon fuels for heating buildings by 2050 through low carbon energy delivered through a combination of hydrogen, electrification and heat networks."[77]

The integration of independent multi-utility network providers into project teams is facilitating innovation. In the 67-acre Kings Cross mixed development, including 2000 homes, 6MW of combined heat and power has been built into the network. The developer chose a single partner for all utilities: Some 99% of the district's heat demand is said to be met from its own Energy Centre, and none of the historic or new buildings on the site require their own boilers or air-conditioning units[78]. This reflects the development principle for the site: *"The scale and nature of the project at King's Cross provides an opportunity to support more sustainable ways of living. From the type of projects we choose, to how we plan, build and manage them, we can facilitate new norms – in consumption patterns, in how we move around, how we use energy and water, and in civic participation".*[79]

At King's Cross the developer chose to work with a single partner from design to connection who would own and operate the infrastructure for all utilities. This was one of the many choices available to them as a result of the growth of the independent networks sector.

The capacity to roll-out new technologies across regions and to support developers in their strategic ambitions for all utilities within a site can be of real value. Suppliers of Electric vehicle charging points, for example, can benefit from working with a single IDNO partner regardless of the region[80]: Whilst this is a service option available to DNOs, it is one they rarely choose to offer.

"As one of the U.K.'s key operators of electric vehicle charging points it has been vitally important for Engenie to have the ability to be able to design and construct our EV units so that they are standardised as much as possible and we know that they're suitable for adoption irrespective of which region they are located in.

Also we wanted to have a pragmatic and flexible approach to easements and needed a partner who would work with us on this. Working with an IDNO has enabled us to successfully achieve all of these requirements, with the added opportunity to separate the construction and asset ownership elements where we chose to."

Martin Miles, Head of Operations, Engenie Limited

A connected nation

In 2019 the new government committed to connect the nation to fibre, bringing an end to the “digital divide”. The coronavirus pandemic brought about a step change in the use of communication technologies. Not only did essential shopping go online, but also communications between friends and family, between doctors and patients, and between volunteers on trials for a COVID-19 vaccine and clinical researchers. It is widely expected that many of these new practices will endure in what came to be dubbed the “new normal”, so that flexible working and home working will be sustained at new levels after the pandemic.

A by-product of ease with which all utilities can now be incorporated into development plans without slowing construction or increasing costs is that whole developments can be connected to fibre. Satellite television signals can be supplied from a single dish, substantially improving the aesthetics of these areas, whilst maintaining each individual household’s choice of service provider. This has been the case, for example, for the 500 new homes at the Milltimber Manor, on the outskirts of Aberdeen, despite its semi-rural location; The Fully Integrated Reception System (FIRS) laid means that a single satellite and aerial array provides all the homes with connections satellite TV, Freeview and DAB radio alongside their open access fibre broadband.

Cable and satellite systems have long suffered from a poor reputation for blighting residential areas by repeated digging of roads and dishes mounted on the walls and roofs of every home. The capacity now to integrate these services into developments as part of a multi-utility package with a single firm responsible will do much to improve the aesthetics of the new streetscape and help meet the desire to put beauty back into development whilst ensuring that every home and business has the modern connectivity required.

8. Conclusions

The 21st century has already delivered a full-scale revolution in the delivery of utility connections. This has been an exceptionally quiet revolution over a twenty year period. Given the scale of the change and the clear benefits that it has brought to development it is extraordinary that it remains 'below the radar' of policy. There are probably two factors underlying this lack of attention.

Firstly, there has been no significant loser from market liberalisation. In this case the "last mile' connection does not threaten the legacy utilities' business model, given that it is a particularly complex part of the energy system requiring these large regulated utilities to accommodate the changing demands of local development projects. Additionally, the final consumer is not expected to pay more for their supplies; an impossibility under the regulatory system.

Secondly, this has been a gradual, but consistent, liberalisation. Within the networks sector liberalisation has not brought the rush of new entrants and subsequent concerns for market stability and service quality, requiring renewed regulation, seen in some other sectors including the retail energy providers who use these networks. Unintended consequences of competition, for example the "hidden charges" in air transport, the initial timetable and fare chaos of bus service liberalisation, or poor customer service in retail energy services have been avoided, and have generated no media headlines.

Instead the number of licensed independent network providers and the range of services on offer, from construction to long-term ownership and from single utility to multi-utility, has grown steadily. This has supported new supply chains around the UK, and enabled multi-utility innovation in development. As a result, the number of connection made by independents now easily outstrips any growth in the total number of UK electricity and gas connections. The increased ease of connection and the flexibility to accommodate changing requirements is making a significant contribution to the attainment of public policy goals. Whether building homes and hospitals against unprecedented ambitions, meeting goals for carbon emissions or fast fibre connections, or achieving economic regeneration, the range of options for utility connections is clearly making a significant contribution.

The risk now is that a lack of attention to this contribution, particularly the focus on energy generation and the retail market, could enable regulatory changes that would halt these positive changes. Better awareness of the "final mile" needs better understanding for its public policy value. This is particularly true when so many of the hopes for the UK to build back from the pandemic of 2020 and to make the best of Brexit are rested on building back better, faster, and greener than ever before.

9. Abbreviations

DNO	Distribution Network Operator
DWIRMAS	Drinking Water Inspectorate Risk Management Approval Scheme (Lloyds Register)
EV	Electric Vehicle
GIRS	Gas Industry Regulation Scheme (Lloyds Register)
GHGs	Greenhouse gases
GNO	Gas Network Operator
HSE	Health & Safety Executive
ICP	Independent Connection Provider
IDNO	Independent Distribution Network Operator
IGT	Independent Gas Transporter
MURS	Multi Utility Recognition Status (Lloyds Register)
NERS	National Electricity Regulation Scheme (Lloyds Register)
OFGEM	Office of Gas and Electricity Markets
RIIO	(Revenue = Incentives + Innovation + Output). The OFGEM performance-based regulatory framework, used to set price controls
UIP	Utility Infrastructure Provider
WIRS	Water Industry Regulation Scheme (Lloyds Register)
WIRSAE	Water Industry Regulation Scheme Accredited Entity (Lloyds Register)

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