



The governance of retail energy market services in the UK: A framework for the future

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1 Introduction

This Working Paper is the first output of research on retail market governance in the theme on “Decision making”, within the UKERC Phase 3 Programme (2014–19)ⁱ. Retail markets are the main commercial interface for most people with the energy system. Current retail energy market governance in the UK is characterized by a quite complex mix of arrangements that have evolved over time. The scale of governance is increasingly complex, for both technical and political reasons, with a trend towards multi-level governance. The role of EU institutions has increased and this seemed set to continue until the EU Referendum; some energy governance is now devolved (although to different extents in Scotland, Wales and Northern Irelandⁱⁱ); and some local government is beginning to play a more active role. However, the principal level is still the nation state, and that is therefore our predominant focus.

The existing market model, developed during the liberalization reforms of the 1980s and 1990s, is essentially a liberalised market system, in which each energy user buys energy units (kWh) from a retail supplier. The dominant suppliers are large, vertically integrated companies (the ‘Big 6’), although there are smaller competitors who have gained some market share in recent years. The supplier purchases energy in the wholesale market, pays the requisite transmission and distribution charges (to the network companies) and fulfils other requirements of regulation and policy in accordance with its supply licence. So the supplier is the single point of contact for the energy user with the energy system – this is often described as the ‘supplier hub’ model. This arrangement has proved controversial in two ways. First, there have been doubts about whether the retail market is sufficiently competitive to avoid unreasonably high profits. These concerns apply particularly to specific groups of customers including vulnerable households and ‘sticky’ customers who have a low propensity to change supplier. The concerns led to an investigation by the Competition and Markets Authority, which proposed some remedies in 2016.

Secondly, there are concerns about the extent to which new policies have been added to the original model. In particular, these relate to new challenges related to decarbonisation of the energy system which were not foreseen at the time of liberalization. Delivering these policies via the supplier hub adds to complexity of the supply business, arguably deterring market entry; it also arguably privileges energy suppliers in the delivery of these new services (such as energy efficiency, microgeneration and smart metering) leading to energy supplier delivery when other business models might be more innovative or cost effective.

We define these services that are being added to the supplier hub as ‘retail energy market services’. They are ‘retail’ in the sense that they relate to the use or generation of energy by actors too small to engage in energy wholesale markets; but they are a

broader category of services than energy units, often outside the scope of the activities covered by the supply licence and therefore potentially in competition with organisations other than energy suppliers. In this sense, ‘retail energy market services’ are a broader category than ‘retail energy supply’, as licensed by Ofgem. Their governance currently sits, somewhat uncomfortably, across the boundary of energy market regulation and the governance and regulation of other services.

Despite these issues, the regulation and governance of retail markets has been subject to less research and scrutiny than wholesale markets. In particular, in the UK, the Electricity Markets Reforms in the 2013 Energy Act introduced very significant changes that affected wholesale markets, including a substantially decreased role for competition, but assumed the continuation of a largely centralized, competitive, supplier hub model of retail markets. The CMA investigation, with a relatively narrow remit, has not changed this fundamental structure.

The paper seeks to investigate the governance of retail energy markets in this new context. To understand both the governance system and the policy paradigm that has produced it, it is necessary to take a brief look at the history of energy governance since the 1980s. The next section of the paper therefore looks at the origins of governance of retail energy markets in the UK: including the notion of governance, the changes during the market reforms of the 1980s and 1990s, the origins, how these played out and the new challenges for retail energy market services that are now emerging that are putting pressure on the existing governance framework. Section 3 sets out some concepts from political science theories of institutionalism and how these might explain the changes that are occurring as a drift in the original paradigm of competitive markets that originated at the point of market liberalization. Section 4 then sets out a proposed framework for thinking about governance options with the range of new technologies, market actors and retail energy market services that are now emerging. Section 5 draws some preliminary conclusions.

2 The evolution of energy retail market governance since the 1980s

2.1 Privatisation and liberalization

The origins of many (although not all) British energy institutions came in the 1980s with privatisation (Helm 2004, Pearson and Watson 2011, Thomas 2006). As is typically the case with the energy sector, change was driven by much wider forces. In this case, a series of economic and political crises through the 1970s led to a radical change in political direction in the Conservative Party under Margaret Thatcher, an abandonment of Keynesian demand management in macro-economic policy, and an avowed shift from

state intervention to free markets in micro-economic policy. Against this backdrop, one interpretation of the privatisation of gas and electricity was that it was driven by the rise of a new policy paradigm in energy, which similarly to other parts of the economy could be described as 'neo-liberal', 'liberal market' and 'market fundamentalist' (Pearson and Watson 2011, Fudge et al 2011, Rutledge 2010a).

British Gas was privatised as a vertically integrated utility in 1986, but the pipeline business was subsequently separated out in 1997. Following the 1989 Electricity Act, electricity privatisation started with the sale of the Regional Electricity Companies, which comprised both retail and distribution, followed in 1991 by the privatisation of the transmission network into National Grid Company and the creation of four generation companies (National Power, PowerGen, Scottish Power and Scottish Hydro-Electric). Nuclear power, widely seen as unviable in a market context, remained in state hands. However, the regulatory process of unbundling distribution networks and opening up energy supply markets to competition took somewhat longer. Domestic gas markets were only opened to competition in May 1998, while competition in electricity supply was introduced in a series of steps from larger to smaller consumers starting from 1990 and only completing with domestic liberalisation in April 1998. Thus the transformation of a state-owned monopoly sector into a privately owned and formally liberalised one was not a single step but rather a long process that took place over a 12 year period. The other major institutional change at privatisation was the handing over of oversight of the energy sector to arms-length regulatorsⁱⁱⁱ with a remit of ensuring competition in markets and increasing efficiency in monopoly networks. This form of delegation was very much complementary to the shift to private ownership, since like central bank independence it was intended to remove regulatory decision making from short-term political pressures and increase certainty for private sector investors, and thereby supposedly reducing the cost of capital, and in turn energy prices (see, for example, CMA 2015a).

Initially, prices were regulated in both networks and in domestic markets, but regulation in the latter was removed after competition was introduced and deemed to be more effective, as described above. Michael Moran (2003: 100–119) describes the complex and contradictory combination of ideas that ultimately determined the regulatory regime in energy. On the one hand, the ideas of the regulatory economist and the first electricity regulator, Stephen Littlechild, were highly influential in determining the design of the regime applied to the newly privatised energy companies (Moran 2003: 104–05). Littlechild adhered to an 'Austrian' view of economics, in which the dynamics of market competition are seen as essential to revealing information about costs, and driving efficiency and innovation (Rutledge 2010a: 16–17; Helm 2004: 59). The ultimate aim was to see the withering away of regulation through the introduction of competition, which was achieved in supply markets. For natural monopoly networks, the objective became how to regulate in ways that mimicked the workings of markets as far

as possible through the rule-based RPI-X framework (Rutledge 2010a: 18–20; Helm 2004: 207–09).

On the other hand, in contrast to this rules-based approach the establishment of the relationship between the government and the new regulatory body was built on principles of discretion, limited public accountability and self-governance. By contrast with the American system with its principles of public accountability and the influence of legally backed direction of regulators, the newly created British system (first seen in the telecommunications regulator Oftel and subsequently copied in energy) involved an individual Director General rather than a regulatory board, and a broad framework of powers in a 'light touch' legal framework (Moran 2003: 105–06). The individual regulator was formally replaced by a board in 2000, at the same time as the gas (Ofgas) and electricity (Offer) regulatory regimes were merged into Ofgem. Some changes in regulatory objectives were introduced, notably to make the regulator's principal duty the protection of customers, including 'future consumers' (representing environmental objectives), rather than the promotion of competition. The Government also took limited powers to provide 'guidance' on social and environmental issues; however, in reality the energy regulator retained a high degree of discretion.

The 1980s therefore saw major institutional change that has set the fundamental context for the UK energy sector ever since. However, there were also some key institutional continuities. The electricity system remained essentially centralised, with large-scale generation delivering power to passive customers through a national transmission and distribution system, and with supply following load. A similar system existed for gas, following the establishment of the national transmission and distribution network in the 1970s.

The idea of a single point of contact for the consumer through the supplier (i.e. the 'supplier hub' principle) was maintained, although distribution networks were to be separated out from supply businesses in the 1990s. The supplier hub approach allows energy sales to be aggregated to a level they are tradable in wholesale markets. The extent to which competition in retail markets (as opposed competition between upstream activities in wholesale markets) has been an effective driver of economic efficiency is contentious. Some key proponents of greater competition in energy markets have always doubted the relative usefulness of retail competition, suggesting that pricing should be based more explicitly on wholesale market costs plus the costs of distribution, metering and billing (Joskow, 2000).

2.2 Liberalised retail markets in practice

The actual experience of liberalised retail energy markets in the UK has been somewhat different from original expectations, partly because of some of the unforeseen consequences of the institutional settlement created by privatisation and partly because of the structural features of those markets (Thomas 2006, Defeuilley 2009, Kuzemko 2015).

One issue is that while domestic retail markets were liberalised at the end of the 1990s, they have evolved to become essentially oligopolistic in nature. Following electricity sector liberalisation in 1998, there were fourteen incumbent suppliers, but a series of acquisitions over the period to 2002 reduced the number down to five major companies (Roques et al 2005, Ofgem 2008). These took the form of vertical integration by large generating firms seeking supply businesses to hedge against risk on large capital intensive investments (Roques et al 2005, Rutledge 2010b, Kuzemko 2015). In gas, competition was also introduced in 1998, although British Gas as the incumbent has maintained a large market share. The five large electricity companies along with British Gas (which also integrated upstream into power generation via Centrica) make up the Big 6, which until recently held over 99% of the British household market.

This emerging market structure raised a number of concerns over the 2000s. There were concerns that vertical integration in Big Six companies was suppressing liquidity in the wholesale electricity market because of explicit or implicit internal trading, making it difficult for new supply entrants to obtain power contracts and creating further barriers to entry and expansion (Ofgem 2009, Kuzemko 2015). The situation appears to have improved in recent years (CMA 2016), but only after Ofgem imposed a number of reforms requiring Big Six firms to trade certain products (and after the establishment of a new exchange platform in the UK by Nordpool).

At the same time, the stable oligopolistic market structure suggested barriers, or at least significant costs of entry and of expansion. Energy supply is characterised by economies of scale (Littlechild 2005) related to fixed costs of entry, and the delivering policy initiatives through the supplier hub model has only added to this cost. The 2014–2016 investigation into the retail energy market by the Competition and Markets Authority provided evidence for regulatory costs of entry in the form of IT requirements, access to data and trading platforms, multiple collateral requirements that tend to be higher for new entrants, and costs of monitoring changes to codes (CMA 2015c).

A second aspect of liberalised retail energy markets is that a significant proportion of consumers do not shop around, but tend to stick with their existing supplier (Waddams–Price 2005, Waddams 2008, NAO 2008, Defeuilley 2009, CMA 2016). This appears to be the case for a number of reasons, including the undifferentiated nature of the product, transaction costs, lack of trust in suppliers and switching websites and a belief that switching is not possible, difficult or will not make a difference.

Once prices were liberalised, companies started to introduce an increasingly complex range of contracts and prices. The combined sale of electricity and gas (dual fuel deals) has been the primary innovation, with about a third of domestic customers on such a contract by 2007 (Ofgem, 2007: 4). Fixed price guarantees have also been relatively popular. The first of these was introduced in 2003, and by 2007 all suppliers offered one, covering 6 million product accounts, or 13% of the market (Ofgem 2007: 13). There were also new channels of retail supply (sales over the Internet) and joint offers (sales of energy associated with telephony or Internet access and more recently other services such as plumbing and electrical maintenance). At the same time, the number of tariffs expanded to the extent that it was hard for customers to make well-informed choices. By 2007 the number of tariffs on offer was already 200, and by 2011 this had doubled (Ofgem 2011). The complexity of tariffs and the fact that the Big Six all have a sticky customer base has led to concerns about discriminatory pricing and an unfair advantage for incumbents (ibid). These concerns led to a limitation of tariff structures and options in 2013, but these still allow each supplier to offer up to 72 options.

There had been an upswing in switching rates through the mid-2000s as prices rose, but this peaked at around 5% of households per quarter in 2008 and then fell off to 2013. In its 2011 retail market review, Ofgem estimated that at least half of domestic consumers had never switched supplier (Ofgem 2011). Another 20%–30% were labelled ‘passive’, i.e. had switched supplier in the past but not in the last year. Only an estimated 10–20% of consumers had switched in the last year, and only half of these had proactively sought out a new supplier. Customer acquisition via doorstep sales increasingly proved a relatively expensive means of expansion, as well as being viewed with extreme suspicion by consumer groups. After a tightening of licence conditions and increasing bad publicity, the Big 6 withdrew from direct marketing of this type in 2011 (CMA 2015: 246). A survey by the 2015 CMA investigation found that 56% of respondents said they had never switched supplier, did not know it was possible or did not know if they had done so (CMA 2015a: 249).

This limited exercise of conscious consumer choice meant that the old pre-liberalisation regional incumbent electricity suppliers and British Gas as the old incumbent gas supplier have a disproportionate share of regional electricity and national gas markets respectively (Ofgem 2011, 2012). Interestingly, it took a major politicisation of energy prices, in the form of Ed Miliband’s pledge to freeze prices in October 2013 and a response by David Cameron to promise every household the lowest cost tariff, to stimulate movement away from the large incumbents. By March 2016, non-Big 6 smaller and medium sized suppliers had around 14% of the domestic market. However, these companies have increased their market share under largely benign conditions of falling wholesale prices, a situation which has now reversed since early 2016. The gap in tariffs between Big 6 and smaller suppliers is now closing, and some analysts predict a shake-out which may lead to reconsolidation (Cornwall Energy 2016).

As noted by MacKerron and Watson (1996: 186), the supposed intentions of policy makers at privatisation were that competition would 'create downward pressures on costs and prices, and ensure that the customer... comes first'. However, the combination of oligopoly and a large number of 'sticky' customers has led to questions about whether liberalised retail markets have in practice delivered the supposed benefits (Ofgem 2011). Over the period in which retail prices were still regulated, the evidence mostly points to consumers not benefitting as fully as they could have done. In electricity, costs fell following privatisation, but margins increased and efficiencies made in networks were not passed through initially (Newbery 2001, Newbery and Pollitt 1997, Florio and Florio 2011). Florio (2004: 229–230) also finds that small consumers did not benefit fully from the decrease in wholesale gas costs over the 1990s.

Concerns about the functioning of energy markets in general and retail markets grew over time. Through the 1990s and up until the early 2000s, underlying fuel prices were low, and so were consumer energy prices. However, with a consistent and steep rise in prices from 2003 to 2008 which was not subsequently reversed, public concern about energy costs started to increase and the issue rose up the political agenda. Discriminatory pricing, confusing tariffs and the lack of liquidity in wholesale markets preventing assessment of whether fair profits were being made all became issues of heated debate.

An Ofgem market probe in 2008 was relatively sanguine about the state of the market, finding that 'the Big 6 suppliers are acting competitively and we have found no evidence of cartels' (Ofgem 2008: 1) although there were some concerns that competition wasn't reaching all consumers. However, another market review three years later took the view that 'there are structural features...that are likely to have the cumulative effect of weakening competition' (Ofgem 2011: 5). With retail prices remaining high through the economic depression of 2009–2013, political pressure on Ofgem increased. As noted above, in 2012 Prime Minister David Cameron pledged to regulate tariffs, and DECC threatened to introduce legislation, leading Ofgem to introduce retail market reform, limiting the number of tariffs each supplier could offer, resulting in the ending of some niche market products, notably green tariffs, and thereby tending to concentrate competitive activity on price.. In September 2013 the leader of the Opposition, Ed Miliband pledged to freeze energy prices for two years. Finally, in 2014 Ofgem referred the energy market to the Competition and Markets Authority.

In their 2015 investigation, the Competition and Markets Authority concluded that the Big Six incumbent firms enjoyed 'a position of unilateral market power over their inactive customer base' (CMA 2015a: 30) and charged such customers more than was justified by their costs, thereby also obtaining, in most cases, profits above their cost of capital. The CMA also found that small businesses were effectively being overcharged for energy. Controversially, the CMA majority report concluded that these problems

should be addressed by seeking to encourage greater competition, for example by creating a database of 'non-switchers' for competitor suppliers to target (CMA 2016). With the exception of pre-payment meter customers (largely low income households) price regulation was not recommended. This has been widely interpreted as a 'victory' for the incumbent suppliers (Helm 2016). It certainly represents a vote of confidence by the competition authorities in the existing competitive supply market model. Whether that confidence remains viable may depend on the challenges discussed below.

2.3 The emergence of new challenges

By the early 2000s the project of liberalisation was complete, but in practice things proved more complex than the designers of 1990s market reform envisaged. The failure, whether real or perceived, of competitive markets alone to deliver optimum outcomes for consumers has led to more direct intervention than originally envisaged in 'arms' length' regulation. In the interim, new policy problems emerged. First, climate change was established as a political priority in the international community by the 1997 Kyoto Protocol, followed by a series of energy policy reports to and by the UK Government demonstrating the scale of required energy system change for climate mitigation (RCEP, 2000; PIU, 2002; Stern, 2007; HMG, 2009). By the early 2000s there were three domestic emissions reductions targets in place, together with a Climate Change Programme launched by the Labour Government in 2000. This programme brought together a number of new policies, including the Climate Change Levy on energy use by large companies, a UK pilot emissions trading scheme, the Renewables Obligation and an expanded energy efficiency obligation placed on suppliers (Carter and Ockwell 2007). Secondly, energy security rose rapidly back up the political agenda (Kuzemko 2014), as UK offshore oil and gas production declined more rapidly than expected leaving the UK as a net importer of gas from 2004 and oil from 2005. Concerns about security were heightened by two disputes between Russia and Ukraine in 2006 and 2009 that led to interruptions in gas flows to Europe. In addition, despite the benefits anticipated from privatisation and liberalisation in terms of efficient prices, many low income households struggled with energy bills, and the eradication of fuel poverty had also been added as a policy goal in the late 1990s. Hence, the so-called trilemma of energy efficiency goals was established – affordability, security and climate mitigation.

As a result, a series of policy interventions and new regulations were imposed on top of basic free market structures in both generation and retail markets. These are described in more detail in Section 2. Some of these came from within the UK, while others emerged from negotiations within the EU, most notably targets for renewable energy that were more ambitious than many in the UK government would have wanted. Carbon pricing instruments by Government outside the framework of energy market regulation have been inadequate (at least at the carbon prices so far experienced) to deliver environmental goals, with more direct and less technology neutral interventions

proving more effective, but requiring intervention in energy markets. Security concerns have grown because of the riskiness of investment in capital intensive projects in liberalized markets, exacerbated by the need for a shift to low carbon investment, provoking more policy instruments designed specifically to deliver new capacity. Much of the impact of this change to date has been in wholesale markets, with more direct and complex regulation, culminating in EMR. However, the same concerns clearly apply in retail markets. Political concerns about existing market structures are arguably even higher here, but to date have emerged largely as concerns about the effectiveness of competition to deliver the traditional goals of retail energy markets, i.e. low cost energy for end users. The result, so far, has been the CMA report. However, our analysis is that this may well prove inadequate. As concerns grow about delivery of key objectives such as climate change and energy security, governance of retail energy market services will need to respond to these wider concerns about the delivery of combined energy policy objectives. Retail markets may be at least as important as wholesale markets in delivering policy objectives and the energy transition, and therefore retail energy market service regulation and governance needs to be understood in this context.

Our starting point for this analysis is the specific goals that retail energy services markets are likely to be asked to deliver. Of course, the traditional role will remain – economically efficient delivery of energy to retail consumers with consumption too small to engage in wholesale markets. However, there are important objectives that may arise from the new agendas of affordability, energy security and climate change. We argue that these are six-fold:

- saving energy (or at least further improving energy efficiency),
- reducing and eradicating fuel poverty
- promoting the demand for renewable electricity
- electrification of some demand
- decentralised (i.e. household or community scale) electricity generation^{iv}, and
- more flexible demand, via demand response and/or distributed energy storage.

The first two of these are long standing; the latter four more recent (DECC 2014).

2.3.1 Improving energy efficiency

Energy efficiency helps with both climate change and energy security objectives, in so far as it reduces demand and, provided it is appropriately targeted also helps reduce fuel poverty. The context for understanding energy efficiency policy is the institutional legacy of liberalisation. It is well established that there are multiple barriers to the take up of energy efficiency measures, meaning that they will not be taken in the absence of strong incentives or rules (Stern 2007: 427–432; Grubb 201, Ch. 4) and that these market failures were not removed by energy market liberalisation (Eyre, 1998).

In a liberalised energy market, the main incentive for consumers to improve efficiency is price, and the most immediately obvious policy tool is tax. However, energy and carbon taxation in the UK has been inconsistent and provides little in the way of clear long term signals. There is political caution in the UK about the use of energy taxation in the household sector, especially since John Major's government was defeated over the use of standard rate VAT on household fuel in 1994. Attempts to introduce an EU-wide energy/carbon tax also failed in the early 1990s, due to opposition to EU level tax raising powers, leading to reliance on cap and trade mechanisms for carbon pricing. However, to date the EU ETS has failed to provide a stable and rising carbon price signal due to over-allocation of permits. The UK Carbon Floor Price Support was introduced to provide such a signal but was almost immediately frozen in the 2014 Budget. This situation contrasts with that in Scandinavia, where high and stable energy and carbon taxation have contributed to much higher levels of efficiency in buildings. On the supply side, there is no real incentive for energy retailers to improve the energy efficiency of consumers, since this would reduce their market for what is a homogeneous product. This is especially true of 'sticky' consumers (see above) since it is from this group that suppliers have been able to make the largest margin.

Historically, it has therefore been accepted that a liberalised energy market alone will not deliver major energy efficiency improvement, and the main policies aimed at increasing energy efficiency delivered through the energy market have taken the form of *obligations* on large energy suppliers rather than arising from innovation by suppliers themselves. This type of scheme dates back to the early 1990s (Mallaburn and Eyre 2014). Supplier obligations for energy efficiency grew very significantly, with the target in terms of energy saved increasing eightfold between 1994–1998 and 2008–2012 (Rosenow (2012: 375). Evaluations have shown these programmes to be highly cost effective (Lees, 2006; Lees, 2008). Different programmes used different metrics over the years, making comparison difficult (Mallaburn and Eyre (2014: 34), but supplier obligations came to be regarded over time as highly successful (Rosenow 2012). These schemes have contributed to the very large rise in adoption of low cost insulation measures seen in the later 2000s and early 2010s (Rosenow and Eyre, 2013) which is a major factor in the observed reduction in energy use (Hamilton et al., 2013). This perceived success is an important reason for the increase in ambition over time. However, as an approach they remain limited in certain ways:

- the incentive structure for suppliers is such that they will work to deliver the targets in SOs, but nothing more (Kuzemko 2015). Until 2012, suppliers found it relatively easy to meet targets, and therefore to complete each Obligation early, tending to leave a hiatus until the beginning of the next one with knock-on effects for the supply chain. Supplier Obligations (SOs) have produced a very artificial market, without the smooth development of an industry that one would see in a natural market.

- The incentive structure for suppliers also means that they have sought to deliver deemed emissions or energy savings as cheaply as possible. In one case, this resulted in suppliers gaming the system through the widespread distribution of CFLs under the CERT (2008–2010) without any requirement to check use (Mallaburn and Eyre 2014: 35). More importantly, as the ‘low-hanging fruit’ in efficiency is increasingly harvested, and more difficult measures (such as solid wall insulation) and whole house approaches become needed, SOs may not be the best way to deliver these (Rosenow and Eyre, 2013).
- Supplier Obligations are quantitative energy saving targets on suppliers, but in a competitive and liberalised market like the UK the costs are expected to fall very largely on household energy bills. Unless the measures are targeted at vulnerable households, the net impact could be regressive. In practice, the requirement for a large share of measures to be delivered in low income households has meant that the overall impact has been progressive (although clearly less so than if they were funded from tax revenues). Some vulnerable households will have been net losers, but to a lesser extent than with many other interventions. Suppliers generally find quotas for vulnerable households harder to meet and this is then a constraint on programme size.
- As discussed above, within the wider institutional and discursive context, SOs were in an ambiguous position. On the one hand they fitted a centralised, large-scale supplier hub model. On the other, by requiring suppliers to reduce energy demand, they worked against rather than with the grain of the liberalised market, and required the investment to reduce energy bills to come from increased consumer prices. With the financial crisis and subsequent focus of government policy on deficit reduction and a rise of political concern about energy bills in the short term rather than the long term, the SO approach became vulnerable. The successor to the CERT, the ECO, saw a scaling back in ambition by two-thirds and then a further dilution of the scheme in 2014 as the target was spread over a longer time period and allowed lower cost measures. The proposals for ECO to 2022, envisage a continuation of this lower level of activity with a move towards eliminating support for households other than those on low incomes.

There is increasing acceptance that a supplier hub model for home energy efficiency is, at best, only a partial solution. The poor public perception of the energy suppliers, coupled to their business model of minimising customer interaction and focus on energy sales, puts them in a poor position to promote anything other than the most basic energy saving measures amongst their customers. Parallel independent advice and support programmes are likely to be increasingly needed as the complexity of measures

rises. However, as part of its reductions in public expenditure in 2011, the Coalition Government terminated support for the national networks of energy efficiency advice centres and community energy groups.

The Coalition government attempted to introduce an alternative, market-based approach in the form of the Green Deal, in which loans were made available to households for energy efficiency measures. Two problems were fairly obvious even at the outset. One was weak demand for energy efficiency in absence of strong incentives or regulations, as noted above. The other was that the loans offered were at commercial interest rates of 6–7% or more, which acted as a major deterrent. With take-up extremely low, the support for the Green Deal has been abandoned by the new Government in 2015.

One important difference between the SO and the Green Deal was the mode of delivery. The obligation in the SO was placed on large energy suppliers (in practice the Big 6), but these firms then often used a number of other actors, including social enterprises, charities and local authorities as intermediaries to gain access and organise installation of measures. The Green Deal had a more open structure in that any organisation could gain accreditation as a Green Deal surveyor or installer if they met certain training and other criteria.

This distinction is important because outside of the artificial energy efficiency ‘market’ created by supplier obligations, the ‘natural’ market for efficient housing materials and heating actually exists in the services of the ‘building trades’ i.e. via builders, plumbers, electricians, architects and DIY shops, while that for efficient appliances works via the markets for fridges, washing machines, electronics etc. (Killip, 2013). These trades and supply chains are generally poorly equipped to deliver the very significant innovations, e.g. very low energy buildings and zero carbon heating systems, which might be needed in a low carbon transition. However, it is not clear that an energy supplier hub model can effectively deliver such innovation either (Eyre, 2013b).

Regulation has been an important energy efficiency policy instrument. In particular, building regulations have been the critical for the fabric of new buildings and for boiler and window replacement); product labelling and standards have been the main drivers of appliance energy efficiency. According to DECC (2014a) estimates, these policies have had an even larger effect historically than other energy efficiency policies (mainly the SOs). Policies that work through supply chains are likely to be particularly important for energy efficiency, since major household decisions with energy efficiency implications are often bundled together in wider decisions about renovations in the home (Wilson et al 2013), which typically involve the building trades. However, these have been orphan policy areas, receiving far less attention than the Supplier Obligations in the UK,

compared for example with Germany, where low cost loans through the 'normal' retail banks has been the major policy intervention (Rosenow et al., 2013).

Within the EU single market, UK policy has been reliant on EU policy for product labelling and standards. Until the recent Ecodesign Directive, this was hampered by the need for a slow process of multi-national agreement on every decision, which is widely considered to have made it less effective than the Japanese 'Top Runner'-style product efficiency transformation programme or even a US 'Energy Star' standards programme. UK Government energy efficiency policy is therefore at an interesting stage in its development. With the plans for Brexit, there is a risk that improved product standards adopted under the Ecodesign Directive will not benefit the UK. This depends on whether the UK still adopts changes in European product standards, either as part of continuing single market arrangements or by separate choice. If it does not, such standards might still operate in practice in markets dominated by European suppliers, unless they adopt a strategy of dumping lower quality products in a deregulated UK market. In other areas as well, the direction of future policy is not clear. The importance of better engagement of households has been recognised, but the Green Deal 'flagship' of last Government has failed to achieve this and is being abandoned, with no alternative yet in place. Sir Peter Bonfield has been asked to build on the work done within the Green Deal on accreditation, innovation and quality standards, but with no apparent link to how investment will be driven. The only remaining significant driver for home refurbishment is the supplier obligation, but this has been severely reduced in scale and even its proponents do not claim it is an approach well-designed to deliver radical change. Some small alternative approaches are being trialled at sub-national level, e.g. in the devolved governments, larger local authorities and the third sector, but in general these remain under-financed to deliver either mass market measures or significant technical innovation.

2.3.2 Eradicating fuel poverty

Fuel poverty was put on the formal policy agenda by the incoming Labour government in 1997, and a fuel poverty strategy was published in 2001 with the goal of eradicating fuel poverty in vulnerable households by 2010 and in all households by 2016. Fuel poverty was defined as having to spend 10% or more of disposable income on energy costs.

In principle, fuel poverty can be addressed by reducing energy prices, a key goal of market liberalisation, or more by more targeted measures to improve the energy efficiency or increase incomes in fuel poor households. Initially, after 1997, energy prices fell so that fuel poverty numbers dropped. With the increase in energy prices more emphasis fell of targeted measures. Two main forms of policy were developed: firstly direct payments, and secondly programmes to improve the energy performance of their housing. Under the first category came the Winter Fuel Allowance for all pensioners

and the weather dependent Cold Weather Payments for people in receipt of defined benefits. Under the second came grant programmes such as Warm Front (in England, and similar programmes run by the devolved Governments) and the targeting of specific parts of the Supplier Obligations to 'vulnerable' households (typically defined as households in receipt of specific benefits). At the same time, the Decent Homes programme for improving social housing also helped reach many fuel poor households. These programmes did have an impact, but they also suffered from a number of problems and limitations: access was often difficult, targeting was sometimes poor because of the difficulties of matching data on energy performance and benefits status (see e.g. Ekins and Lockwood 2011), and there were particular problems in helping vulnerable households in the private rented sector and those using pre-payment meters.(Boardman, 2013; NAO, 2009) And, from 2004 the energy price/income ratio in low income households rose more sharply than the improvement in energy efficiency, progress towards the targets was reversed.

By 2010, prices had stabilised, but fuel poverty rates remained high. In the economic depression following the financial crisis, wages stagnated, while benefits were cut. At the same time, austerity constrained policy options. Warm Front was wound up in England. In its place a more targeted rebate scheme, the Warm Homes Discount, was introduced for pensioners. However, as the depression continued the situation did not improve. The Coalition government responded first by changing the definition of fuel poverty and next by revising the targets.

Following the Hills review of fuel poverty in 2012, the basis of the official definition was changed to focus on households with above average energy costs and below poverty line incomes, which had the effect of reducing the number officially in fuel poverty and making fuel poverty numbers less sensitive to overall home energy efficiency. According to ACE (2014), the number of households in fuel poverty in England, on the original definition, increased by 85% between 2011 and 2014, to just over 4.8 million. On the new definition, the number of households increased by 11% to just under 2.5 million. At the same time, the 2013 Energy Act amended the legislation underlying the 2001 targets, which were replaced with a target of ensuring that 'as many as possible fuel poor homes as is reasonably practicable' live in at least Band C rated homes by 2030. The effect of these two acts has been to make fuel poverty a smaller and less urgent problem from an official perspective, as well as one which is less sensitive to general energy efficiency policy. Even on the new definition, there is still a significant proportion of households in the UK which struggles to pay bills and keep warm in winter. In a comparative perspective, the UK's record on fuel poverty is amongst the worst in western Europe (Boardman, 2013).

Whilst fuel poverty, and fuel bills in low income households more generally, have a lower political profile than when fuel prices were higher, it remains an issue in energy policy.

In particular, there is concern that the lower proportion of ‘active switchers’ and higher reliance on pre-payment tariffs amongst these households leads to them having higher than average prices. The recent CMA report concluded that these constitute an “adverse effect on competition through reducing suppliers’ ability and/or incentives to compete to acquire prepayment meter customers” (CMA 2016:43). As a remedy the CMA recommended a price cap should apply to domestic customers on prepayment meters for a transitional period from 2017 to the end of 2020.

In summary, at any given level of energy prices, strong energy efficiency programmes remain the best hope of reducing household energy bills, and good targeting can help (but not perfectly ensure) these benefits accrue to those in the greatest need. Critically, the investment needed in homes occupied (and even owned) by households with low incomes and limited capital may need to come from different sources than for the same measures in ‘able to pay’ households. However, the new definition of fuel poverty places greater emphasis on energy cost inequality. Clearly some of the drivers and policy solutions lie outside the remit of what is usually considered to be energy governance (e.g. in wider economic and welfare policy). However, there are issues for energy regulation, including whether markets as currently regulated deal adequately with the needs of low income and vulnerable customers.

2.3.3 Promoting Renewable Electricity Supply

Since the liberalization of electricity supply in 1998, there have been initiatives to promote voluntary supply of renewable electricity – green electricity tariffs. In all cases, the process has been driven by a combination of concerns about misleading green claims and a desire to promote consumer action on green electricity. Following the publication of draft guidelines by Ofgem, in 2002, the *Future Energy* initiative to label green supply was launched by the Energy Saving Trust. Despite widespread support in principle for such a scheme, it soon collapsed as no agreement could be found about the interaction of the voluntary market with the new market in green certificates created by the launch of the Renewables Obligation in the same year. In particular, there was no agreement about whether the relevant Renewables Obligation Certificates (ROCs) should be retired.

Concerns about mis-selling of green electricity grew and led to another initiative from Ofgem in 2009, but they maintained a preference for self-regulation. In response, the Big 6 energy suppliers and Good Energy agreed a Green Electricity Supply Certification Scheme (GESCS) overseen by an independent panel. The key rules were determined by Ofgem and avoided the contentious issue of the interaction of green tariffs with ROCs and Climate Change Levy Exemption Certificates (LECs). The double selling of green supply was prevented by a requirement to match sales with the (very low value) Renewable Electricity Guarantees of Origin (REGOs) required under EU law. Additionality had to be added by other means such as defined levels of carbon offsetting.

The GESCS scheme was successful in bringing the main suppliers into a single agreed framework and eliminated double selling by scheme participants. But the additionality rules were widely considered to be unsatisfactory. A number of alternative, uncertified green tariffs were launched by other suppliers, leading to another Ofgem consultation in 2014. At about the same time, most of the Big 6 suppliers withdrew their voluntary green tariffs from the market as a result of the reduction in number of allowed tariffs under the Retail Market Review. The Ofgem investigation concluded that licence conditions should be introduced to prevent double selling by all suppliers, but it took no action to specify required levels of additionality or to address the complexities introduced by a gradual shift from a quantity based support scheme (the RO) to price based support (CfDs and FITs). Ofgem invited the GESCS panel to continue to oversee additionality, but in the absence of a viable number of tariffs or any guidelines on additionality, the Panel declined to do this and the GESCS scheme was terminated. The current situation is therefore that REGO matching is required for a green tariff to be marketed, but there are no guidelines on additionality. Despite the rapid growth in renewable generation, only some of the smaller suppliers are currently offering green tariffs. This may therefore become a means of differentiation between incumbents and new market entrants.

This history indicates that existing market structures have not encouraged retail energy suppliers to be proactive in marketing green electricity. To some extent this may be due to the low levels of renewable generation in earlier years and the benefits of selling renewables to business eligible to benefit from CCL exemption. However, neither of these now applies, and therefore the decision of the Big 6 to abandon green tariffs in the RMR process is probably more indicative of wider structural pressures on vertically integrated companies.

2.3.4 Electrification of demand

Most analyses of energy futures that meet low carbon goals foresee an increase in electrification of end use demand both globally (Edenhofer et al., 2014; IEA, 2015) and in the UK (CCC, 2008; Ekins et al., 2010; HMG, 2011). The sectors in which this change would have most impact are transport and heating, which are currently dominated by direct use of fossil fuels.

Transport is currently very largely fueled by petroleum products outside the scope of retail energy markets, as normally defined (electricity and gas). The widespread use of electric vehicles would change this very substantially and potentially raises some interesting questions.

First, electric vehicles can be charged either at specialist commercial facilities, like petrol and diesel vehicles, or at more distributed sites, e.g. homes and workplaces. The choice, or more probably balance of choices, has implications for charging infrastructure,

distribution network reinforcement and the relative size of different sections of the retail energy markets. Taxation, network regulation and land use planning decisions can all affect the outcome.

Secondly, road fuel taxes have historically been very much higher than those of household and business fuels, and therefore the electrification of vehicles would tend to lead to a very large loss in tax revenue (more than £25 billion per annum). If Government wishes to maintain this revenue stream under vehicle electrification, it might need to levy separate tax rates on different end uses, which clearly has implications for metering, but also potentially opens the intriguing question of more diverse taxation regimes for different end uses.

Finally, and potentially most importantly, the electrification of transport would imply the use of batteries for electricity storage in much greater amounts than at present. Whether such distributed storage would be used to re-supply other electricity demands on the grid (vehicle to grid, V2G) will depend on the performance characteristics of future batteries. But even if their use is confined to supplying the host vehicle (grid to vehicle, G2V), it potentially provides a very large capacity to shift electricity demand in time, at least diurnally. It is therefore a key part of future demand response (see below). Heating energy use is dominated by direct of fossil fuels, in the UK as in most countries. It is been known for many years that significant reductions in carbon emissions can be achieved using energy efficiency and CHP (RCEP, 2000). However, at national emissions abatement levels of 60% or greater some use of zero carbon vectors is likely to be required (PIU, 2002). For a number of years, the dominant narrative of UK policy was that very significant electrification of heating would needed to meet climate targets. Indeed some analyses, based on results from economic optimisation models indicate almost complete electrification (CCC, 2008; Ekins et al., 2010; HMG, 2009). This is because, although using electricity can add to costs, it may be the best route to decarbonisation of heating as it allows the use of low carbon technologies more naturally suited to producing electricity (nuclear, CCS, wind and solar). The dominant assumption was that heat pumps would play a key role, as these enable carbon mitigation at lower levels of electricity decarbonisation (Lowe, 2007) and require less electricity than direct resistance heating. Ground source heat pumps already have a high market share in some countries with low cost electricity, e.g. Sweden, Switzerland and Austria, and there is a growing market for air source heat pumps in mid-latitude countries, e.g. Italy, France, New Zealand, Japan and some regions of China (Lucon et al., 2014), but remain a small niche market in the UK. However, the ease with which mass electrification of heating might be achieved has subsequently been questioned (Eyre, 2011; Fawcett, 2011; Hoggett et al., 2011; Speirs et al., 2010), based on practical concerns about the deployment and use of a novel technology at scale and particularly the very large implications for peak electricity demand (Eyre and Baruah, 2015). This has resulted in some moderation of the projected role of electrification in UK policy (DECC,

2013), with a bigger emphasis on heat networks in urban areas. However, heat networks themselves are not a panacea. They require significant capital investment. The most cited exemplars in other northern European countries largely rely on gas CHP, which is not a low carbon technology, and, whilst heat networks can utilise a range of heat sources, the potential of waste to energy schemes, waste heat and biomass is limited. UK progress in stimulating low carbon heating technologies is weak. The Renewable Heat Incentive (RHI) essentially provides a Feed-in Tariff for solar water heating, heat pumps and biomass heat production. Uptake to date has been limited, with just under 16,000 installations at September 2016. The RHI operates within the supplier hub model, but with costs met from general taxation rather than by energy users. This leads to the same concerns as for energy efficiency obligations, i.e. that energy suppliers are not the obvious source of investment or customer engagement for these technologies. They are not installers of heating technologies (with the exception of British Gas) and their business model of kWh sales of gas and electricity is not naturally suited to encouraging technologies that reduce the use of these fuels.

One other effect of a low carbon heating transformation has a potential impact on retail energy market service governance. This is the long run reduction in demand for natural gas. Ultimately, this could leave the low pressure gas network as a stranded asset, raising difficult question about who pays for the necessary safety and decommissioning work. Alternatively, the network and gas retail market might be re-configured to provide a low carbon gaseous fuel, such as hydrogen, biogas or gas from 'power to gas' technologies. Any of these would be a transition as profound as the switch from town gas to natural gas in the 1970s, raising fundamental questions about how that coordination might be achieved, especially in a liberalized market.

2.3.5 Decentralised electricity generation

In the domestic sector, policy for decentralised generation is much more recent, and has generally taken the form of incentive schemes for micro-generation. The bulk of support for micro-generation has been for renewables, and of these by far and away the most prevalent has been solar PV. Through the 2000s support for solar PV took the form of a number of small grant schemes, but these were replaced in 2010 with a feed-in tariff. The UK was relatively late in adopting such a structure for support of renewable energy in 2010, mainly because it did not fit well with the dominant market-led policy paradigm. Woodman and Mitchell (2011: 3915) document the British government's resistance to the approach, based on the grounds that it would work against competition and was an attempt to 'pick winners' which was bound to fail given government's inferior information and technical capacity relative to the private sector. Instead the chosen approach was the Renewables Obligation which was primarily aimed at large scale investors, and therefore operated in the electricity wholesale market. The FiT, operating in the retail market, was introduced only after a vocal campaign by the small-scale renewables lobby and environmental NGOs.

Once in place, the FiT led to a rapid take off in installations. Digression of the tariff rate was built into the scheme, but when growth was more rapid than expected in 2011, unscheduled changes were made to rates, with negative effects on the supply chain and confidence in the scheme^v. Nevertheless domestic installations have continued to rise and have now reached an estimated 825,000 (DECC Statistics, July 2016). By contrast, small-scale wind remains marginal, mainly due to technological barriers, especially poor performance in urban areas and vibration.

The Feed-in Tariff for domestic solar PV has been relatively successful. However, it has also been criticized because the benefits (which initially especially were quite generous) have mainly accrued to better off households able to finance the upfront costs, while the costs have again been spread across all households as additional costs on bills (Grover 2013). Like other support for renewable electricity, it also falls within the Levy Control Framework and is therefore vulnerable to uncertainties affecting the LCF envelope and political pressures to limit levies overall (Lockwood 2016).

As a result of these factors, the Government sharply reduced support for solar PV in 2015, reducing the domestic scale FIT to 4.4 p/kWh and capping support at less than 400MW/year. This decision has been strongly opposed by the representatives of solar and distributed generation technologies. However, there is agreement on the broad economic analysis that underpins the proposal, i.e. that the costs of PV generation will reach 'grid parity' with household retail electricity prices in the UK in the foreseeable future. The potential for small-scale PV (less than 50 kW) on buildings in the UK is estimated to exceed 140 TWh/year (almost 50%) (Parsons Brinckerhoff, 2015). The implication is that, in coming decades, retail electricity market services might require investment on a similar scale to that in wholesale markets and that a very large proportion of the UK population might become involved in energy markets as electricity generators, as well as consumers. Even a decade ago, this would have been considered an unrealistically optimistic assessment. It was certainly an eventuality that the designers of current retail market structures did not consider.

A further potentially relevant area of distributed energy policy is support to community energy, since community projects might be seen as having the potential to engage individual households, making them more proactive about energy use, efficiency and distributed energy themselves. This has been an orphan area until the 2014 Community Energy Strategy, with roughly £25m for early stage financing and a £200m Green Investment Bank funding line. It is probably too early to say what effect this will have. Other aspects of the UK institutional context are not necessarily supportive, including access to non-government finance. The Financial Conduct Authority has also created uncertainty by opening a review process in 2014 that challenged the cooperative form of ownership for community energy projects. Community energy in the UK still remains a

niche activity, compared with countries like Germany and Denmark, with only around 0.3% of GB generating capacity (DECC 2014b). Nevertheless, there are an increasing number of community energy groups, and an emerging trend of city governments wanting to become suppliers (most publicly so far, Bristol, Nottingham and London).

2.3.6 Flexible Demand

A final relevant objective of policy is flexible demand. Historically the UK electricity system has been 'load following', i.e. whatever consumers demand, the system has been geared up to provide supply for. However, as the proportion of intermittent renewables in electricity generation increases, it will be increasingly important to avoid sole reliance on costly backup generation (which in the near term is likely to be fossil fuel), flexibility on the demand side will be especially valuable. Interconnection across systems (within and outside the UK) may be able to help address this (Newbery and Grubb, 2014; Pudjianto et al., 2013), but demand response and energy storage also probably need to play an increased role. The ability to flex demand is also likely to be important for minimising the increase in electricity network costs arising from electrification of heat and transport, especially the former because of its impacts on peak demand. Demand response can be provided either by re-scheduling (or avoiding) the consumption energy services (e.g. clothes washing and refrigeration) to times of lower system stress, or by using distributed storage to retain the same services but using storage (of electricity or heat) to re-schedule its impact on supply.

So far, demand side response has played a very small role in the UK energy system, confined to interruptible contracts with large industrial users in gas and similar contracts in short term operating reserve with the electricity system operator amounting to a few hundred MW (although some of this 'demand side' response actually involves switching to on-site generation). Demand side response also contributed to the first UK capacity auction in 2014 (for delivery in 2018), but only provided 147 MW of the 49 GW of bids supported, i.e. 0.3%.

Households have not so far been involved at all in DSR, except for the 2 million households with electrical storage heating and immersion heaters with tele-switching, an historical arrangement that is coming to an end (Elexon 2012). One barrier has been the absence of accurate half-hourly metering, which should be removed through the roll out of smart meters by 2020 or so. But several other barriers also remain, including a lack of a legal and commercial framework for domestic DSR with sufficient customer protection, arrangements for access to data, required changes to codes and licenses, and engaging and gaining the trust of consumers (Lockwood 2014).

The other question is how far domestic consumers are willing and able to flex their demand. Owen et al (2012) take the view that current technical potential is 'modest'. Elexon (2012) estimate that annual time-switched electricity demand through tele-switched heating is 0.5% of electricity supplied. On the other hand, the recent

Customer-Led Network Revolution trial of electricity demand shifting showed reductions in peak demand of up to 10% (albeit with a self-selected sample of households). The potential might increase dramatically if and when electric vehicles and/or dedicated battery storage devices are deployed in large numbers.

Stand-alone distributed battery storage is now being marketed. It is already potentially competitive in jurisdictions with a high solar resource and regulations that promote on-site use, but will need to fall in price before it can be competitive in the UK. However, battery costs have fallen by a factor of three since 2010 (Nykvist and Nilsson 2015) and this trend looks set to continue with huge growth in production by Tesla. Storage potentially has value that cuts across traditional distinctions in electricity regulation (generation, supply, balancing and networks) and therefore poses particular challenges for governance.

Heat pumps also potentially provide a significant potential for demand response across the day, especially if linked to heat storage, but unavoidably increase daily peak demand, because they reinforce the seasonal correspondence of heating demand and electricity demand in the UK.

An interesting question is what form a potential future market for flexible demand by households might take, and how it would interact with the licensed retail energy market. One possibility is that incumbents may offer flexible demand contracts to existing customers; some Big Six suppliers are already promoting smart thermostats and home automation^{vi}. Another is that new entrants – either suppliers or aggregators – for whom flexible demand is more central to the business model may emerge, as indeed they already are^{vii}. A further possibility is that network companies, generation customers and the system operator may try to trade flexibility with domestic customers, almost certainly through an aggregator intermediary. A mix of all of these is also possible. Unlike energy itself, the market for flexibility does seem to be an area with considerable potential for technological innovation and product differentiation.

2.4 Summing up

Following privatisation and liberalization, the model for energy governance was that competitive markets were expected to achieve lower prices and better service for consumers. When new objectives arose in the 2000s, the same fundamental model with a few simple changes was also expected to deliver, i.e. security by liberalized markets nationally and internationally, and environmental objectives through liberalized markets with a carbon price.

However, the reality has been much messier and far less successful. Even on the core function, liberalized markets did not work as expected. While there is a degree of competition between suppliers, this competition is only really effective amongst a

minority of customers. The majority of customers have never switched supplier and most of the market remains chronically 'sticky', even when the political salience and media visibility of energy prices rises. In electricity, vertically integrated suppliers also have an incentive in a stable customer base; no incumbent suppliers have an interest in a high degree of customer churn. While new entrants have had some success over the last 3 years, they still supply less than 10% of the domestic market.

The problem of disengaged and sticky customers is not unique to Britain; on the contrary it is if anything worse in other countries. However, the implications are very different in the UK from those jurisdictions that use price regulation, rather than relying on competition alone, for household consumer protection. Options for reform of retail energy markets depend a lot on what view one takes of this challenge, i.e. whether it can ultimately be overcome through improved competition, or whether energy is too basic and homogeneous a product, in which case disengagement is a permanent feature that markets should be designed around.

However, this is not the only challenge facing retail energy market service governance in Britain. Energy efficiency policies that have largely relied on a mechanism – supplier obligations – that has achieved a degree of success but that have worked against the grain of the market rather than with it. As the cost and complexity of required retrofitting of housing increases, this approach looks less attractive. It is therefore institutionally and discursively vulnerable, because of the increasingly problematic distributional consequences, supporting a few major retrofits at the expense of other households. At the same time, more natural roles to market for energy efficiency intervention – through the building trades and product markets – are relatively neglected. The same issues are being seen in the market for low carbon heating technologies.

In relation to the original ambition, fuel poverty policy looks like a complete failure. Definitions and targets have been revised, which makes this failure look less acute. However, the underlying problem remains and worsened up to the date of the latest official data (2014). Although subsequent fuel price falls may have reversed the trend, the new definition makes the problem less amenable to solution through energy policy. Policies for distributed energy production by households have seen some success since 2010, most notably in support through feed-in tariffs for roof-top solar PV. However, as with energy efficiency policies, the funding of solar PV support has been through levies on bills, with undesirable distributional effects and vulnerability to political intervention. The declining costs of PV, and the Government response to it, have now reduced future cross-subsidy, and it may provide a potentially disruptive innovation in the retail electricity market.

The net effects of supplier obligation and feed-in-tariffs on bills is not that large; they have been less important historically than the effects of the RO and in future may be less important than the effects of carbon pricing (DECC 2014)^{viii}. It is also quite clearly the case that the sharp rise in energy costs over the 2000s was due to underlying fuel prices, not policy costs. Nevertheless, given levels of fuel poverty, the distributional effects of these policies matter. This is especially the case since lower income households bear a disproportionate share of such pass through costs, since they are likely to be on tariffs that are higher than the average (CMA 2016, Preston et al 2010). They are also vulnerable to the politics of austerity and tax, especially when energy prices are high.

Finally, the retail energy services market may become more complex in the near future with the advent of smart metering and the possibility of domestic consumers being offered deals for demand flexibility. This looks like being a rather different type of market from the traditional energy market, and while the two may be integrated from the householder's viewpoint, it is also equally possible that they will operate as two separate markets, with a different set of actors. In the short term, demand flexibility in the household sector may be limited, but this could change radically with technology innovation in batteries, especially for electric vehicles.

Overall, there are thus two important drivers for a fundamental rethink of retail energy market services governance. One is that the existing policy approach of liberalization for fair efficient pricing plus add-ons for energy efficiency and fuel poverty has not worked, or is limited, especially in light of future needs. The other is that new technology, i.e. the advent of decentralized energy production, potentially large new electricity demands, smart metering and the possibility of demand flexibility, is changing the nature of the market itself, as is increasingly recognized by suppliers themselves (e.g. Wood 2015). At the same time, a successful rethink needs to encompass all of these issues; trying to fix one problem (say more effective competition) without acknowledging the other issues is likely to at best work only partially.

Brexit adds to the uncertainty going forward. In some ways, the impact will be limited. UK policy change in energy market governance has tended to lead, rather than lag, EU policy. In particular, energy market liberalization in the EU largely followed the UK model and therefore the removal of single energy market rules would have limited immediate impact on UK market design. The single energy market rules primarily affect wholesale, not retail, markets.

In some cases, specific EU policies have been the major drivers of UK policy, for example the target for renewable energy. In others, such as product efficiency regulations and emissions trading, the UK is currently very dependent on EU arrangements. In all these cases, policy could be weakened by Brexit, but not inevitably, with the outcome depending on specific policy choices within the Brexit process, rather than Brexit itself.

The fundamentals of energy policy objectives arise from the role of energy in society and are therefore likely to remain. Brexit may increase pressures on, and therefore attention to, some objectives: for example if gas security is more problematic outside the single market or investment generally is seen to be more risky. Outside an EU framework, some other objectives, e.g. climate mitigation, could be downgraded, but again this would be a specific UK policy choice not an inevitable outcome of Brexit. The challenges for retail market services governance, as set out above, arise from the existing pressures on the current arrangements and prospective changes in energy technologies and systems. The former are largely national in origin and the latter global, so both are only weakly influenced by EU membership.

3 An institutionalist interpretation

The history outlined above will be familiar to most observers of British energy policy. However, in order to interpret this history, and organize thinking about how the future might be different, some kind of analytical framework is necessary. In this section we argue that an institutionalist framework – and particularly theories of institutional change – is useful for interpreting the evolution of retail energy markets in Britain, and diagnosing the problems that have arisen.

At the core of institutionalism is the claim that ‘institutions matter’ (Lowndes and Roberts 2013); i.e. that outcomes and the actions of participants in a system (in this case the energy sector) are heavily shaped by existing institutions (Thelen 2002). However, institutionalism is also concerned with how institutions are formed and evolve. Rational choice approaches see institutional arrangements as representing optimal equilibria between actors acting rationally and strategically (Shepsle 1986, Hall and Taylor 2006). Other approaches, notably historical institutionalism, emphasise the fact that institutional design also has unanticipated and unintended consequences, and the operation of institutional constraints over time (Pierson 2004), and therefore the importance of path dependence (Steinmo and Thelen 1992, Hall and Taylor 1996). It is also concerned with the operation of unequal power within institutions, i.e. how institutions “shape political outcomes by facilitating the organization of certain groups while actively disarticulating others”, not just through the mechanics of coalition formation but also “how they influence the capacities of groups to recognize shared interests in the first place” (Thelen 2002: 92).

Early thinking about institutional change emphasised stability, implying that change happened mainly at moments of crisis precipitated by external trends of shocks, leading to ‘critical junctures’ and consequent radical institutional reconfigurations that are then again stable in the changed circumstances. In the long term, this creates a pattern of ‘punctuated equilibrium’ (Kingston and Caballero 2009, Peters 2012). However, it has become increasingly recognised that much institutional change actually happens more

incrementally, through different combinations of rule replacement, layering, drift or conversion (Streeck and Thelen 2005). The resulting overall pattern is then one of ‘punctuated evolution’.

Early institutionalism has been criticised for an inadequate treatment of the role of ideas in institutional formation and change (Blyth 1997, Campbell 1998, Schmidt 2010). Ideational institutionalists therefore emphasise the importance of ideas in several roles, including as tools for institutional change (especially during moments of failure and crisis of existing institutions), as institutional blueprints, and as the medium of institutional reproduction (Blyth 2002). In this approach, institutional change can *only* occur through the use of and contestation over ideas. This broad approach is helpful in understanding change in energy policy for retail markets, at two levels: that of ideas and that of institutions.

3.1 Paradigm shift or paradigm drift?

The 1980s saw a clear and decisive transformation in ideas about energy policy. This was part of a much wider change in economic policy under Margaret Thatcher, from Keynesianism to monetarism and from state intervention to free markets. In this shift, Hall (1993: 279) emphasized the role of ideas, arguing that: ‘policymakers customarily work within a framework of ideas and standards that specifies not only the goals of policy and the kind of instruments that can be used to attain them, but also the very nature of the problems they are meant to be addressing’, a framework that he labelled ‘policy paradigms’.

In the energy sector, the new paradigm was most famously signalled in 1982 by the Energy Secretary Nigel Lawson, who stated that the task of government was not to plan energy, but ‘rather to set a framework which will ensure that the market operates with a minimum of distortion and energy is produced and consumed efficiently.’ (Lawson 1982)^{ix}. The changes in wider economic policy were precipitated by a crisis of high inflation and low growth in the 1970s. Changes in the energy sector were less crisis-driven but nevertheless represented a ‘critical juncture’ (in reality rolling on through the 1990s) which reset all the main institutions, as described in section 2.2 above, and established the idea that markets were the solution to the challenge of ensuring energy supply at the lowest cost.

As then described in section 2.3, over the 2000s, old problems of energy security reemerged and new ones of climate change appeared, leading to an expansion of the scope of policy problems, and the gradual introduction of more and more government interventions in or on top of markets. Writing in the mid-2000s, Helm (2005) argued that as a result the old market-led paradigm had been replaced by a new paradigm. This view was echoed by others, including Kern et al 2014).

However, in practice, the older idea that free markets are the best route for achieving objectives has remained very powerful. This idea was embraced by the new Labour administration that came in in 1997, with the then Trade and Industry Secretary Peter Mandelson declaring in 1998 that:

'I am convinced that competitive markets are the best way of stimulating efficiency in industry, of providing consumers with real choice and bringing down prices. They are the cornerstone of our approach to energy and power generation' (quoted in Pearson and Watson 2011: 18).

The market-led paradigm principles of 'more private ownership, the removal of restrictions on trading and the promotion of competition' (Helm (2005: 2) in practice remain a default preference in energy policy design. Where there are major interventions, for example in support to renewable energy, the preferred design of policy has often been to allow competition to set prices, through portfolio standards or through auctions for contracts for difference. The same applies to the new capacity market. The use of regulation has been sparing, and administrative price setting even more so.

This suggests that rather than a true paradigm shift in energy policy away from the market-led approach of the 1980s having already occurred, we are instead still in an inter-regnum period, during which the limits of the existing paradigm are becoming more and more apparent, but there is as yet no widely accepted replacement. As Helm (2005: 16) notes: "the paradigm shift in policy objectives has yet to be translated into a coherent set of policy instruments..." but rather has seen the addition of "new interventions, and ever more institutions, in an ad hoc way to the existing framework." Or in the words of Kern et al (2014: 10): "Although the interpretive framework has altered to include climate change and geopolitical ideas, elements of belief in market ideas continue to persist alongside".

We thus argue that rather than a shift from a market-led policy paradigm in energy to some new coherent paradigm, we are still in a period of paradigm 'drift'. Why does this distinction matter, especially for our discussion of retail energy market services governance? The key point, we argue, is that the absence of a new paradigm and the erosion of the old one suggest both the necessity and the value of opening up fundamental questions of policy design and objectives. Incremental tinkering is more likely to further increase incoherence and undesirable interactions than to solve the new and old problems in energy service retail institutions discussed above. In particular, we need to be able to ask fundamental questions about the need for and efficiency of markets across all aspects of energy service retail institutions.

3.2 The centralised supply model

While the 1980s saw transformations in ideas, it also saw a key continuity. This was that the overall conception of the energy system involved a few large actors on the supply side which would provide energy through centrally balanced transmission systems in a flexible way to meet the needs of many small actors on the demand side.

Old publicly owned and centralised producer interests in gas and electricity were reborn as new privately owned but still centralised producer interests in the form of generation, network and supply companies. These were unbundled in a regulatory sense in the 1990s, but generation and supply were reintegrated commercially on the electricity side through vertical integration fairly swiftly. The number of companies initially increased following liberalisation, but likewise horizontal consolidation in the 2000s quite quickly produced a few large dominant companies, making it easier to coordinate an industry voice, which effectively became the new incumbent voice^x.

The creation of new actors with interests in the old system of centralised supply, along with the continued acceptance of the ideas of centralised supply as the basis of the system in the wider epistemic community in government and the regulator, helped maintain policies and regulations that supported this design, right down to details of energy industry codes (Lockwood et al 2015).

In the unbundling process, a decision was also taken that all costs would be passed through to consumers (except possibly large industrial users) via suppliers. In particular, the newly created distribution network companies would have no direct communication with consumers. Over time, this 'supplier hub' principle has been extended to most areas of policy that impinge on consumers, from the passing through of the costs of policies on renewables and capacity, to making suppliers the organisations on whom energy efficiency obligations , to the decision to have the smart meter roll out led by suppliers. The implementation of large parts of energy policy relating to retail energy consumers has effectively been delegated to suppliers, who have effectively become gatekeepers to consumers.

Because the supplier hub principle has become the default for thinking about policy, it has led many to assume that suppliers will or should be the actors who engage consumers in new markets and areas such as distributed generation and demand side response. In the early phase of thinking about the management of data from smart meters the main view was that suppliers should be the gatekeepers, although this was later changed once it became clear that it would make sense to provide access to other actors on an equal basis. It has also led policy makers to pay less attention to the delivery of existing goals through routes other than suppliers, such as the role of builders, plumbers and electricians in energy efficiency upgrades and low carbon heating.

In rethinking retail energy markets, these default principles of a centralised supply model and the supplier hub must be questioned. Technological change is creating a much bigger potential role for a decentralised demand focused model, but this potential will only be realised if policy and regulation adapt accordingly. Similarly, the best actors to deliver consumer involvement in both existing areas such as energy efficiency and new areas such as demand side response and distributed generation may well not be energy suppliers, and again policy and regulation needs to reflect this. That this is possible is demonstrated by the Green Deal, which did step outside of the supplier hub principle to incorporate other actors, although suppliers remained the actors responsible for billing.

3.3 Policy coherence, layering and veto points

A consequence of these strong but often unexamined ideas guiding energy policy is that they have contributed to a pattern of ‘layering’ in policymaking since the 1980s, which has undermined the coherence of policy over time (see above)

As noted above, Streeck and Thelen (2005) developed a four-fold characterisation of types of gradual change. ‘Displacement’ is the most straightforward, in that it involves the removal of old institutional rules and their replacement by new ones. However, full displacement in arenas such as energy policy is a relatively rare form of institutional change, meaning that other forms of change are likely to be important. ‘Layering’ also involves the introduction of new rules, but in ways that do not displace but rather places them alongside or on top of existing ones. ‘Drift’ occurs where there is no formal rule change but where the impact of existing rules changes because of changes in the wider environment. Finally, ‘conversion’ refers to situations where rules formally remain the same but are interpreted and enacted in new ways.

This framework was further developed by Mahoney and Thelen (2010), who attempt to provide an explanation for why particular types of change tend to happen in specific political contexts and in institutions with particular characteristics. They argue that both displacement and layering involve the introduction of new formal rules. However, displacement of existing rules only occurs where there are no opportunities for veto by actors who are in an institutional position to block change and have interests in doing so (Tsebelis 2002). Otherwise, change happens in the form of layering. Other forms of gradual change, namely drift and conversion, occur when actors have a degree of discretion in compliance with and the interpretation of rules. However, in the energy sector rules tend to be highly formal and with few opportunities for interpreting compliance. We would thus expect the nature of policy evolution to be in the form of displacement or layering.

The market-led, centralised supply and supplier hub paradigms discussed above have institutional dimensions that provide opportunities for veto. The market-led paradigm was underpinned by the creation of independent regulation in energy (as in other newly-privatised utilities) within a 'light touch' legal framework that gave considerable discretion and veto powers in relation to government (Moran 2003, DECC 2011). A commitment to liberalised markets is built in to Ofgem's core task of protecting consumers by ensuring that the competition is operating effectively. Over the 2000s, the regulator was rather resistant to the idea that any problems with retail markets, and only later, under considerable political pressure, brought in measures such as the restriction of the number of tariffs and interventions intended to displace regional incumbents. Despite these interventions, political debate about retail markets continue to intensify in the 2010s, reaching the point where the leader of the opposition proposed price controls in 2013. It was in this context that Ofgem finally appealed to the Competition and Markets Authority, an independent body equally committed to markets but with greater analytical resources. The CMA inquiry has similarly led to a renewed commitment to the basic institutional arrangements (except for a relatively small group of pre-payment customers) but with further layering of policies (i.e. a database of switchers).

The supplier hub principle has strengthened the position of supplier companies, who have then also used the principle to lobbying for retaining a degree of control over energy policy processes. This can be seen, for example, in the development of smart meter policy, where suppliers first resisted a roll-out, and then when a roll-out was mandated, they successfully sought to gain control over the process (as opposed to, say, distribution network operators, which have led roll outs in other countries). The principle has meant that suppliers have had requirements placed on them (although the history of the various energy efficiency obligations shows that these requirements have been set in a way that suppliers have found it fairly easy to meet them), but conversely they have had control not only over the way in which requirements are delivered, but also over communication with consumers and over consumer data.

Another example of institutional veto opportunity is the energy industry codes system, the governance of which is dominated by large incumbents with assets in centralised generation and in gas and electricity networks, and the core content of which is still designed for a centralised supply model (Lockwood et al 2015).

However, we would argue that, in addition to institutions, *ideas* themselves can also provide powerful veto opportunities. This approach fits well with Hall's (1993: 279) concept of a policy paradigm, since for actors undertaking 'normal policy making' within such a paradigm, 'so much of it is taken for granted an unamenable to scrutiny as a whole'. Proposals that breach the paradigm can usually be ruled out automatically, so that the paradigm effectively has a vetoing effect. It also resonates with Blyth's (2002)

argument that one key role of ideas is in providing institutional stability, in the form of conventions that coordinate actors' expectations. Certainly, as discussed above, the idea that markets should play the central role in energy policy has had sufficient power that it has not been displaced. Equally, the supplier hub principle in itself has effectively vetoed alternative approaches to policy (for example the greater involvement of network companies in the delivery of energy efficiency).

The result over both ideational and institutional veto effects has been that, as new interventions have been made to address problems arising from within the existing paradigms or from new problems (such as climate change), they have not displaced the underlying ideational and institutional structures but rather have been layered on top. We argue that it is possible to identify three broad areas in which such interventions have taken place in attempts to meet trilemma goals. These are investment, innovation and consumer/citizen engagement (Table 1).

Table 1 – Specific interventions and their trilemma goals

	Affordability	Decarbonisation	Security
Investment	Warm Front Energy Company Obligation	Carbon Emissions Reduction Target District Heating Investment Green Deal Finance	Electricity Demand Reduction Pilot
Innovation		Feed-in Tariffs Renewable Heat Incentive	Smart meters
Engagement	CMA Database of 'sticky customers Energy Performance Certificates Energy labels Smart meter in home displays	Carbon Reduction Commitment ESOS Green Deal Advice Low Carbon Communities Challenge Community Energy Strategy Microgeneration certification scheme	

Investment: at the point of market liberalization, securing adequate investment an assumed outcome of a well-functioning market. In practice the risk of energy insecurity to Government has proved higher than to market participants, and the option of inducing investment solely through high prices has limited political attraction. The problem is exacerbated by the need to deliver rapid decarbonisation in electricity generation, and declining gas use, in both cases leaving incumbents with potentially stranded assets. So delivering adequate investment has become a necessary part of both climate and energy security policy. The most obvious example is in the Electricity Market

Reform (EMR) set out in the 2013 Energy Act, where both Contracts for Difference and Capacity Auctions have adequate investment as the goal. Similar interventions can be seen for LNG storage and interconnection. There are similar issues in retail market services. Smart metering is being rolled out by Government mandate, through the supplier hub, despite some benefits to market participants; decarbonisation of heat is supported by specific incentives and the experiment with a more open (non-supplier hub) approach to home energy efficiency in the Green Deal has been abandoned as a failure, leaving supplier obligations as the only significant policy (Rosenow and Eyre, 2016).

Innovation: traditional economic regulation delivers static, not dynamic, efficiency. The low carbon transition requires early adoption of low carbon technologies in advance of them being cost effective, even with a significant carbon price. Again, the best known resulting policy instruments have been in electricity wholesale markets, notably through the Renewables Obligation. However, support for innovation has increasingly been added to policy objectives, including economic regulation of networks. The 'light touch' economic regulation preference for 'technology neutrality' proved ineffective to address the need for different mechanisms at different stages of the innovation process (development, demonstration, deployment). A need for policy differentiation also applies to technology scales. In particular GW scale technologies require innovation support in wholesale markets, but kW scale technologies in retail markets. The result has been a range of different, and now increasingly politically contested, policies instruments.

Engagement: there is increasing recognition of the issues raised by social acceptability of large scale technologies, which clearly has an impact across a wide range of energy technologies – fracking, CCS, nuclear power, onshore wind, solar farms and transmission lines. Policy responses vary from governance processes that seek to increase acceptance through community engagement (e.g. community energy) through to 'streamlining' planning processes to sidestep opposition. The same issues apply, in principle, to the smaller scale technologies for which retail markets are more relevant – such as energy efficiency and building integrated renewables – but with an important addition that investment in these technologies generally requires active engagement by consumers rather than just passive acceptance. The well-known phenomenon of under-investment in building energy efficiency shows this is a significant factor in improving the economic efficiency of the energy system. The design and governance of retail market services may well be able to affect these issues, and therefore is therefore potentially very important in the context of a wide range of distributed technologies and operations that may be part of the low carbon transition, e.g. demand reduction, demand response, distributed generation, distributed storage and electrification of heat and transport).

In many cases these interventions themselves have not worked well and so have had to be adjusted, and unanticipated interactions have multiplied. The result is a messy compromise, with inconsistencies that exercise many observers (Keay et al 2012, Bird 2015, Helm 2013). The key implication for this paper is that greater coherence can only be achieved by dislodging veto opportunities in institutions and challenging the constraining power of existing paradigms. As above, this implies being able to question some fundamental assumptions in the policy sphere, but it also means being able to look at the possibility of rethinking, if necessary, some of the institutional arrangements for the governance of the energy sector.

4 Implications for Future Governance

4.1 A Framework for Retail Energy Services Market Analysis

The implication of the analysis above is that the layering of additional policies on the market paradigm adopted at the time of market liberalisation is increasingly opening up questions about the suitability of the paradigm. In energy retail services markets the specific features that might then be questioned are:

- the value of liberalised markets (in this specific area),
- the supplier hub, and
- the centralised supply model.

The challenges come primarily from the new technical and social requirements in energy retail services markets. These are leading to a much broader range of activities that will be needed in energy service retail markets. These differences between the traditional conceptions of retail market functions and likely future needs are set out in Tables 2 and 3. Logically, these will need to be undertaken by either the incumbent energy supplier or some other actor.

Historical thinking about energy retail markets has been that their primary function is the efficient aggregation of demand (usually at low time resolution due to the lack of more time-resolved data) up to a scale where it can be supplied from wholesale markets. The critical functions of the supplier are efficient billing and purchasing in wholesale markets. Both have economies of scale, so that the dominant market structures that have evolved are monopoly utilities and competition between large specialist suppliers. In competitive market frameworks there has been a tendency towards a limited economy of scope in the form of gas–electricity dual fuel deals. Billing needs to be accompanied by customer support services. In the UK since market liberalisation, these have been largely limited to physical meter reading and a call centre, but increasingly are moving to automatic meter reading and on–line billing, where economies of scale may be lower. Perhaps more importantly, these increased levels of ICT in customer data potentially allow the development of added value services.

Efficient purchasing faces the problem that wholesale markets tend to operate on short timescales (half-hourly in the UK), whereas to date consumer prices can only be changed relatively infrequently. Moreover, traditional meters do not enable time of use charging. Both factors increase risk to suppliers. This is a particular issue if retail energy prices are regulated but wholesale prices are not, and this was a key feature of the Californian energy crisis in 2001. However, even where retail prices are not regulated, as in the UK, suppliers need to hedge price risks. Non-vertically integrated suppliers can achieve this via futures markets, but, especially where these are not well-developed, risks are lower where there is vertical integration. This business model became the dominant organisational structure of energy suppliers in UK markets after liberalisation, i.e. “the Big 6”.

The minimalist model of energy retail, as set out in Table 2, is therefore wholesale purchasing and the metering/billing functions essential to sales. Upstream purchases of gas and electricity may be capitalised to the extent that they are either owned or contracted long-term, but this is not essential to the supply business; energy may simply be purchased as a commodity in wholesale markets. The only hardware associated with supply is the meter: this also needs to be installed and maintained. Otherwise supply is a ‘virtual business’ – aggregating a large number of small demands, but excluding completely the upstream physical activities of energy extraction, conversion, transport and with no investment in technology on customers’ premises. It is a high volume, low margin business with more similarities to the retailing of fast moving consumer goods than other, high investment, energy activities.

Table 2 – Traditional Retail Activities

	Activity requirements				
Activity	Wholesale market purchasing	Financing downstream investment	Household Installation	Operations	Market Aggregation
kWh supply	Purchasing: long term contracts or wholesale markets	None	N/A	Billing	Aggregation of energy
Metering	N/A	Meter investment	Meter installation	Meter reading	N/A

As we set out above, the extent to which competition between large, vertically integrated suppliers provides a more efficient mechanism for reducing these costs in practice has been strongly debated, culminating in the recent CMA report (CMA 2016).

However, compared to our analysis, the CMA report has a limited scope, as it largely neglects potentially important drivers of future markets.

This is because the UK retail energy services market is increasingly becoming more complex in ways that the CMA enquiry does not, and was not asked to, address. For many years, energy efficiency measures and social obligations have been placed on the larger licensed suppliers, as part of the ‘supplier hub’ of policy delivery. However, these have not changed the underlying business model. Social obligations generally relate to customer advice and prices, especially for vulnerable customers, and therefore only require more sophisticated systems for customer segmentation. Energy efficiency obligations have largely been delivered by sub-contracting, e.g. to insulation installers, housing providers and white goods retailers. Supplier contributions to energy efficiency schemes have been financed (with Government and regulatory approval) from annual revenues rather than treated as investment. With the exception of Centrica, which, as a result of its history as the monopoly gas utility, owns British Gas Services and therefore has a major stake in gas boiler servicing, the Big 6 have been rather reluctant to extend the scope of their business model to the customer side of the meter. Sales of ‘green electricity’, always a very small niche product for the ‘Big 6’ are now dominated by specialist smaller suppliers (see Section 2.3.3 above).

The changes occurring in electricity generation and wholesale markets clearly have implications for electricity suppliers. The shift towards technologies with very low short run marginal costs is tending to depress wholesale electricity prices. The growth of variable renewables is leading to greater variability of prices. And the increase in decentralised generation is increasing the number of generators. Together these increase the complexity of electricity purchasing for suppliers, but the fundamental driver to purchase efficiently is not affected. German vertically integrated electricity suppliers have been particularly affected by these trends, as the growth in renewables generation has been dominated by new market entrants. In the UK, the supplier hub governance model, in particular the Renewables Obligation, has incentivised the major suppliers to have a bigger role in renewables investment (Mitchell et al, 2006), so that the ‘Big 6’ own half of renewables generation. This reduces their exposure to risk, but growth of renewables still reduces the profitability of incumbent generation assets, and therefore makes rapid growth in unconventional generation financially unattractive^{xi}. This may explain their observed reluctance to promote ‘green electricity’ as a differentiated product.

The changes in investment on the customer side of the meter are potentially very much larger and more diverse, covering energy efficiency, distributed generation, low carbon heat and distributed storage. Table 3 sets out, in brief, the activities implied by changes to energy retail services markets.

Table 3 – Future Retail Energy Service Market Needs

			Activity requirements		
Activity	Wholesale market purchasing	Financing downstream investment	Household Installation	Operations	Market Aggregation
kWh supply	Purchasing: contracts or wholesale markets	None	N/A	Billing	Aggregation of energy
Metering	N/A	Smart meter investment	Smart meter installation	Smart Meter data	N/A
Energy efficiency	N/A	Household and business investment	Insulation, heating systems, appliances etc.	Advice and smart system operation	Into capacity and flexibility markets
Demand response (DSR)	N/A	Metering and control systems	Metering and control systems	Advice and smart system operation	Into capacity and flexibility markets
Low carbon heating	N/A	Household and business investment	Heating systems	Advice and smart system operation	Into capacity and flexibility markets
Green electricity supply	Renewable energy purchasing	N/A	N/A	N/A	For renewables incentives in wholesale markets
Distributed generation	N/A	Household and business investment	Micro-generation systems	Advice and smart system operation	Purchasing for wholesale, capacity and flexibility markets
Distributed storage	N/A	Household, business and vehicle charging investment	Micro-storage systems and vehicle connection	Advice and smart system operation	Purchasing for wholesale, capacity and flexibility markets
Social obligations	N/A	Vulnerable household investment	Insulation, heating systems, appliances etc.	Advice and smart system operation	N/A

Future investments in distributed generation and storage, low carbon heating and advance efficiency measures will need to be bigger than traditional, low cost energy efficiency measures. Whilst most early movers are likely to be able to finance their own work, this will not be so true as mass markets develop. Household and business installation work will also expand in scope and complexity. Loft insulation and cavity wall insulation are relatively straightforward and there can be contracted out as a “commodity installation”. More complex energy efficiency measures require more measures and better skilled installers, hence the reluctance of the Big 6 to support the shift in regulated activity towards solid wall insulation. The same observations apply to the rapid growth in distributed generation through the deployment of PV. Leading energy suppliers have been minor players, with physical installation dominated by new specialist solar companies, and incumbent roofing and electrical companies expanding their business models. Early indications are that the same is happening for both low carbon heating technologies and distributed storage. However, as incumbent utilities face declining profitability in traditional activities, including fossil fuel electricity generation, they are also trying to move into these new markets, for example through the offering of automated home energy system controls.

Incumbent supply businesses are also more active in the changes that are happening in metering. Some of the early benefits of smart meters are expected to be more reliable billing and reduced operating costs. As discussed above, in the UK the supplier hub model has been extended to smart metering, so that the roll out required by 2020 is their legal responsibility. Half-hourly meter data should also enable suppliers to operate more efficiently in wholesale markets and it potentially allows new services, e.g. smart phone apps, to be offered without changing the business model to physical products. As smart metering becomes the norm, the scope and opportunities for more sophisticated retail energy market engagement increases. Demand side response, distributed generation and storage all potentially have value in capacity auctions and balancing and ancillary service markets, as well as network benefits. New market entrants in retail energy services will want to capture these values. Incumbent suppliers have the same incentives, but also need to consider the implications for existing profit streams, so that the development of their business models is less straightforward: as with other market changes, it probably depends on the balance of impacts on the core business, new value opportunities and regulatory requirements. With increasing complexity, network operators may increasingly become involved in real time system operation. There are various possible models for such involvement, including a Distribution System Operator (DSO) approach focusing on power flows, or the model being explored in New York at present of Distribution Service Providers (DSPs), which would involve network companies in local market platforms (Mitchell 2014, 2015, 2016)

In short there are many activities in future that are associated with this expanded conception of energy retail services markets. The extent to which they will be delivered by the energy supplier (i.e. the organisation selling kWh to final users) is unclear and will be driven, in part, by the governance of these markets. In Table 4 we set out the broad potential roles of different market actors.

Table 4 – Actors and their potential roles

	Incumbent Supplier	New business model supplier	Other energy businesses	Non-energy organisations
Wholesale market purchasing	Supply is vertically integrated with large scale generation.	Potential to differentiate sources of generation, e.g. green supply		
Financing downstream investment	Traditionally restricted to the meter, but can be required via obligations or facilitated by on bill financing	Supply plus ESCO finance	DNOs for network benefits; and potentially as holders of obligations	Retail banks Major consumer brands Government, charities and LAs (e.g. where there are social benefits)
Household Installation	Traditionally only metering, with obligations delivered through sub-contracting	ESCO installation activity, linked to supply	Community Energy companies	Technology providers, specialist installers and general construction.
Operations	Extended traditional business model, e.g. to smart homes apps	New business models, e.g. smart home apps Aggregators of other functions	DNOs as DSO model develops	ICT Specialists, e.g. via smart appliance Apps
Market Aggregation	Already supplier core business for energy units. Other activities can be added	May prioritise new activities, e.g. green supply, half-hourly settlement , DSR and storage	Community Energy companies	Specialist aggregators of multiple services

4.2 Governance issues

Our analysis of the history of energy institutions and the framework developed above suggests that there are a number of key issues for retail energy service market governance in what will be a more complex system. We suggest that there are seven important dimensions, as set out below:

1. Extent of competition and use of regulation
2. Approach to vertical integration
3. Ownership
4. Scope of the licensed supply business
5. Role of network owners and operators
6. Role of non-energy businesses
7. Governance scale

These dimensions can also be seen as relating to the three principles underpinning past energy policy identified in Section 3 above, i.e. a market-led paradigm, a centralised supply model, and the supplier hub principle. Thus dimensions 1, 2, 3 relate to the market-led paradigm, dimensions 4, 5 and 6 relate to the supplier hub principle, and dimension 7 relates to the centralised supply model. We argued above in section 3 that all three of these principles should be opened up to fundamental interrogation.

In many cases, the choices that need to be made are not simple binary options. For example, even the apparently binary choice between whether or not to regulate prices raises question about which customers and which services should be covered.

4.2.1 The Market-led Paradigm

4.2.1.1 Extent of competition and use of price regulation

The debate about the effectiveness of competition has been at the heart of political discussions about energy retail markets in recent years in the UK. In thinking about this issue, we argue that the first necessary step is to distinguish between the different markets identified above, i.e. the supply market for kWh and emerging new energy services markets.

A second step is to focus not on competition as an end in itself, but on the outcomes that it is intended to achieve, i.e. efficient pricing, transmitting information about costs, and stimulating innovation. In the traditional kWh supply market, the CMA investigation has decisively shown the difficulties faced in making competition work in such a way that it delivers these outcomes. On prices, the problem of consumer stickiness prevents markets working well; the behaviour of consumers in energy markets does not conform well to standard neo-classical economic assumptions. Those consumers who lose the most from this situation tend to be the most vulnerable. This problem is not particular to the UK and is endemic across all countries. Furthermore, it is not at all clear that smart metering change this situation, as the CMA hopes.

At the same time, liberalised markets for kWh supply have not produced any meaningful innovations outside of tariff packages over the last 20 years. Furthermore, it is not clear why society would want suppliers to innovate in ways that would lead to an expansion in their markets; indeed *reduction* in energy demand is a goal of policy. Energy supply should increasingly be treated as a ‘residual’ market.

For these reasons (perhaps most especially the latter), we argue that serious consideration should be given to the re-regulation of prices in the retail kWh energy supply market (at least for SMEs and households).

By contrast, we see the urgent need for innovation and cost reductions in the other activities identified in Table 2 above, and competition between the full range of actors identified in Table 3 as a plausible way to achieve these goals.

Thus whereas markets in the supply of kWh have led to a dominant role for large vertically integrated companies, other dynamics appear likely for other retail market activities. Smaller specialist suppliers have already made progress in the supply of green electricity; construction and technology companies are playing a more significant role in energy efficiency, microgeneration and low carbon heating. In domestic demand response, a new entrant has been quicker to offer half-hourly settlement than any of the Big 6 (Ashden Awards, 2016). Clearly, it is essential to be licensed in order to trade demand side response and storage products in energy retail markets. However, revenue streams from capacity auctions, ancillary services markets and network benefits are increasingly also important for these activities, and therefore an assumption that suppliers are necessarily the critical players in these activities may not be correct. New models for local energy markets may also be needed in the future.

We argue that the supplier hub principle is a problematic lens through which to view these new areas of activity as it militates against a level playing field, and that there is strong case for a reduced reliance on supplier obligations and greater emphasis on more open support regimes, such as Feed-In Tariffs (see also section 4.2.2.1 below).

4.2.1.2 Approach to vertical integration

UK governance arrangements since 1998 have favoured vertical integration in both gas and electricity sectors, as a means of managing risk (Kuzemko 2015). Energy security risks have impacts on supply businesses, but also on energy users, and therefore governments and regulators. This has been illustrated by crises in systems with liberalised generation markets elsewhere in the world, notably California in 2001 and Norway in 2002/03. Recent trends in electricity show some weakening of this model in the UK. There is increased diversity of ownership of new generation (especially small renewables and capacity auction clearing fossil generation) and new entrants in supply markets. However, vertical integration remains the dominant business model and some new entrants are moving towards this structure.

The most common objection to vertical integration has been that it reduces wholesale market liquidity, and therefore the effectiveness of competition, to the detriment of consumers. This clearly depends on the specific circumstances, and the CMA concluded that vertical integration does not currently have an adverse effect on competition in the supply of energy units (CMA, 2016).

However, in the context of our concerns, the more important question is the impact on other energy services. Vertically integrated companies that principally make profits on energy generation and sales clearly have a disincentive to reduce supply. Both energy efficiency and distributed generation, are unhelpful to their basic business model. In this sense, the supplier hub model of policy delivery, requiring suppliers to promote efficiency and distributed generation, conflicts with their fundamental incentives. We conclude that there is a problem of split incentives for some energy market services within the current energy retail market. However, the problem arises not simply because the market has strong elements of vertical integration, but because it combines this structure with a supplier hub model that focusses efficiency and distributed generation policies on companies with this split incentive.

Activities affecting the temporality of consumption (smart metering, DSR and distributed storage) are more complex as they potentially allow risk reduction for all suppliers (although perhaps less so for vertically integrated companies), without reducing the total flow of energy through the system. We would therefore expect (and increasingly do observe) that the vertically integrated companies are more active in these areas than in distributed generation and energy efficiency.

None of these arguments has yet to convince UK policymakers to restrict vertical integration. And current trends towards greater diversity on either side of the wholesale market may reduce concerns about vertical integration.

Our conclusion is that vertical integration *per se*, is not the key issue, but rather its combination with the supplier hub model for wider policy delivery.

4.2.1.3 Ownership

Current governance arrangements in the UK are formally neutral with respect to ownership. However, the underlying logic of the regulatory framework is based on the assumption that actors operate as profit maximising, commercial companies. To a large extent this is a reasonably accurate description of the business model of the major UK energy suppliers (although the ultimate holding company of EDF has majority ownership by the French government and that the parent company of npower, RWE, has a significant minority ownership by German municipalities).

However, the dominance of privately-owned and non-price regulated companies in the UK energy retail market remains unusual, both in terms of the history of energy systems in the UK and internationally. There are signs, although still limited, that a broader

range of actors with different ownership structures and business models may become active. The greatest changes have happened in distributed generation with the rise of community energy companies with a range of different legal forms (e.g. cooperatives and other social enterprises), but to date they have not been able to operate effectively in energy retail markets. In the wake of recent political controversies, some large local authorities have become interested in energy supply, essentially aiming to undercut incumbents by operating a not for profit model. And district heating systems are likely to involve local governments, at least in coordinating local actors, but possibly also in investment and energy use (Hawkey et al 2013).

Equivalent treatment of different ownership models in regulation is not strictly necessary or inevitable. For example, most US states treat investor-owned energy retailers very differently from municipally-owned utilities, recognising that socially-owned enterprises may not require rate of return regulation to protect consumers.

However, there has yet to be any debate about the impact of ownership models on energy regulation in the UK. The most obvious forum for such an issue would be in Ofgem's consultations about 'principle based regulation', but the latest thinking on this (Ofgem, 2016) does not discuss how application of regulatory principles might be affected by ownership. The early moves to not-for-profit models described above are essentially niche developments, and therefore probably do not merit fundamental changes in energy governance. However, the increased importance of investment on the customer side of the meter seems likely to assist business models with higher levels of retail market customer trust. A variety of ownership outcomes is possible in the UK, probably depending on the scale of new ownership models. These range from the persistence of privately owned companies as the dominant players through to a more mixed economy, including local government and other forms of social ownership. We conclude that UK regulation has been established on the assumption of profit-maximising companies. Whilst this is the dominant model, the notion of principle based regulation should allow for consideration of different rules for organisations that are not profit maximising corporations. More discussion the relationship between ownership and the on regulatory system is therefore warranted.

4.2.2 The Supplier Hub Principle

As set out in Section 2, the basic supplier hub emerged from the UK energy market liberalisation process as a means of simplifying the engagement of consumers with the energy market. It was designed to reduce the transaction costs of buying an undifferentiated commodity in competitive market. Subsequently, a wider range of activities, designed to deliver social and environmental goals, were added to the supplier hub – a process we analyse as 'layering'; in Section 3. Policymakers chose this approach for a number of reasons. Energy retailers are mainly large companies, and therefore capable of undertaking the required functions; they are already licensed, and therefore there is an existing legal framework for placing obligations upon them; and the obvious

alternative of the Government funding the policies directly was usually problematic due to constraints on public expenditure.

The challenges that have arisen, in particular that of conflicting objectives, were partly foreseen. However, as the layering has increased, so have the concerns that the approach may become unfit for purpose. In essence the objections fall into two categories. One is that the scope of the role of energy suppliers should not be continually extended; the other that the activities would be better undertaken by other actors. The actors relevant to the latter objection fall into two broad categories: other energy companies and actors outside the energy system.

4.2.2.1 Scope of the licensed supply business

Our working assumption is that the critical role of energy services in society means that energy suppliers need an explicit licence to operate that codifies minimum expectations, at least for household customers. This will necessarily include some obligations with respect to vulnerable customers. We note that this assumption is widely shared internationally. As the recent CMA enquiry (CMA, 2016) shows, even in markets where competition is well-established, it does not alone produce efficient or socially acceptable outcomes.

However, there is a potential tension for public policy. Over-regulation can exclude innovation, both by raising the cost of new entry in general and by proscribing (perhaps unwittingly) innovative business models. In an energy system where rapid innovation is required, this is a significant risk (Ofgem 2015).

Supplier hub models have some advantages in terms of reliability of policy delivery, certainly in the short term. The failed experiment with the Green Deal as an alternative to supplier obligations is a good illustration. On the other hand, the experience with supplier obligations for renewable electricity is that they have in general been less effective than price based mechanisms, as the latter reduce risk further and better incentivise actors outside the incumbent energy supply sector (Woodman and Mitchell, 2011). As the scope and type of decentralised activity increases, a supplier hub is likely to be less and less viable. In particular, there is growing consensus that specialist technical services in installation are likely to be better undertaken by other actors. The regulatory arrangements associated with the supplier hub tend to point to energy regulation (i.e. Ofgem rules) expanding into this wider area of energy service market rules. Where regulation is currently inadequate, this may have some immediate benefits. For example, one benefit of the supplier hub approach to energy efficiency was clear guidance on acceptable practices in the insulation industry.

However, it is far from clear that this is the best long term framework. As Table 4 makes explicit, not all the functions that have been added to the supplier hub are necessarily

bundled with the supply of kWh; other actors potentially have important roles. Some activities require different skills and/or business models, and might therefore be more effectively and efficiently undertaken by different actors. ‘Regulation’ and ‘energy regulation’ are not synonymous; removing activities from the purview of Ofgem does not necessarily make them ‘unregulated’. In the long term, it seems much more logical for practices in the building, electrical sectors to be dealt with by the relevant sectoral regulatory agencies.

Our conclusion is that the supplier hub is unlikely to be the most effective or cost effective approach for many of the policy interventions required related to innovative products, technology installation and financing. Policies in these fields should be more neutral with respect to actors, seeking to allow a range of actors to promote innovation and embedding responsibility for that change more clearly in the relevant economic sectors.

4.2.2.2 Role of the network and interaction with supply

The dominant model for energy supply in much of the world remains, as it was in GB until 1998, the ‘utility’ model of combined operation of the distribution network and a monopoly (or at least dominant) retail energy supplier. One tenet of market liberalisation in the UK, followed now in the whole EU, is a clear separation between the “natural monopolies” of distribution systems and “contestable activities” in wholesale and retail energy markets, in order to avoid cross-subsidy.

Whilst this approach remains intellectually valid and workable if supply and distribution are largely independent, it becomes problematic if they interact sufficiently strongly that the two cannot be operated independently in an efficient manner. Demand side contributions to network upgrades have always been problematic in this regard, but the strength of interactions is increasing, especially because of the deployment of intermittent distributed renewables and the potential for using DSR and/or distributed storage to address network constraints.

It is widely accepted (e.g. IET 2016) that the existing model of passive distribution network operation is not sustainable. The problems of a supplier hub model with respect to grids therefore seem likely to grow. Innovative business models are already looking to ‘stack up’ value streams that cut across the traditional sector of energy governance – i.e. competitive markets, capacity mechanisms (run by Government), balancing and ancillary markets (run by the ISO) and grid benefits. Cost effective operation of the electricity system as a whole therefore requires, at minimum, better coordination of the governance arrangements of these elements of the system. In governance terms, there are two broad categories of potential solutions. The first is the development of distribution system operators (DSOs), analogous to the national SO, with the mandate to tender for (but not operate) supply and demand side resources to

address investment and operational challenges cost effectively. The second would be to return to pre-1998 arrangements (still the dominant model in the USA) of a regional, or even local, utility providing the distribution system and a monopoly retail supply service. Both constitute a major change to DNO function, but the latter also implies a major retail market change (see for example New York's proposals for a radically different model in which it is intended that local market platforms will be run by 'distribution service providers' (DSPs) (Mitchell 2014, 2015, 2016)). There is a spectrum of intermediate solutions in which the utility provides everything from a default service for 'sticky' customers through to a near monopoly with only large users offered a choice of supplier.

In either of these structures, DNOs could play a bigger role in some of the other retail energy service market activities set out in Table 3. In a monopoly utility model they automatically take on any supplier hub type obligations. But a DSO model could also include functions like energy efficiency obligations. This is the Italian and Danish model for energy efficiency SOs and operates very largely as a market based system with the investment activity undertaken by energy service companies (ESCOs) that sell tradable energy efficiency certificates to the obligation holders (Pavan 2008). This increases competition in the supply of energy efficiency services, unlike supplier obligations. The reasons to be concerned about monopoly companies entering competitive markets were understood at the time of market liberalisation and have not disappeared. However, network operators are increasingly key actors in some necessary changes in the electricity system. Better coordination of governance is required to enable efficient operation, as is change to regulation (e.g. Poudineh and Jamasb 2014, Ruester et al 2014). Whatever the particular option pursued, the underlying point is that the approach would allow policymakers to use network companies rather than competitive suppliers as the hub for some policy delivery.

4.2.2.3 The role of non-energy businesses

Non-energy business, i.e. those not regulated or licensed by the energy regulator, have always played a key role in many activities on the customer side of the meter, in particular in financing and installation. With an increased need for this type of investment, there is no reason to believe this will change in any plausible future governance system. However, energy governance matters for non-energy businesses, because of its role as a driver of value from markets in the energy system. There is a spectrum of openness to non-energy businesses. Some involvement in building technology installation and finance will happen in any plausible governance system. At the other end of the spectrum, only energy suppliers can act as aggregators in retail energy markets, by definition, and this seems unlikely to change. In between, governance options do affect the opportunities for non-energy businesses. Supplier hub models tend to favour direct provision of services by suppliers more than do price support mechanisms and direct Government support. In obligation schemes, the

resources that drive this value are essentially controlled by suppliers; in price support mechanisms like FiTs, they are mediated through them. Some technologies, e.g. DSR and storage, are likely to rely on multiple value streams including energy market arbitrage, capacity auctions, balancing and ancillary services and avoided network investment, and therefore supplier control of a few value streams can affect the viability of much wider business models for non-energy businesses. . High levels of complexity, low transparency and price volatility all constitute risks to non-energy businesses, deterring investment.

The focus on supplier hub policies has clearly affected the pathways for a number of energy retail market services. The most obvious example is household energy efficiency services, where the long period of dominance by supplier obligations left the relevant installation sectors (e.g. insulation) singular ill-equipped to deal with the overnight transition to the different delivery model of the Green Deal, leading to sectoral collapse. The structure of the UK renewables sector, with its focus on large scale wind projects, has been influenced by the long period of reliance on supplier obligations. And the problems faced by the roll out of smart meters are related to the non-geographical approach and complex IT arrangements driven by a supplier-led approach. Our conclusion is that non-energy businesses are, and will remain, important actors in financing and installation. In other areas, non-energy business involvement has been constrained and shaped by supplier hub approaches. Going forward, policies should allow and incentivise the desired outcomes through approaches that incentivise relevant actors without intermediation by energy suppliers. However, the shift to this should not be done without consultation and effective transitional arrangements.

4.2.3 The Centralised Supply Model

4.2.3.1 Governance scale

Most of the discussion above assumes unitary national markets. Despite some variation in policy in the devolved administrations and the regional organisation of distribution networks, this remains a reasonable description of UK retail energy markets, with the exception of the separately organised markets in Northern Ireland. Both market rules and the major supply companies operate across Great Britain. Most of the key drivers of energy policy – system security, affordability and carbon emissions – are perceived primarily in national terms.

Some aspects of governance are already supra-national, e.g. global carbon agreements and EU energy competencies, although the latter may be ‘re-nationalised’ in Brexit. In the opposite direction, there are disruptive forces pointing towards more localised governance. The discussion of DSOs and DSPs above shows the potential for smaller-scale retail markets to develop; local economic actors are increasingly considering energy investments (e.g. in heat networks); the economic potential for both wind and solar is unevenly distributed across the country; and this means that the value of DSR

and storage will also spatially dependent. Uniform governance arrangements may therefore become increasingly difficult to justify and operate.

Some form of multi-scalar governance therefore seems likely, but with a wide spectrum of outcomes. At one end of the range is the retention of a predominantly national system, with limited competencies acceded to the EU and regional differentiation to allow for regional resource variation. At the other end of the range, there is the possibility of a more decentralised system of regional markets and regulation, with strong local actors, with national markets and institutions providing a connecting function (Eyre, 2013a).

The rapid development of smaller scale generation technologies, in particular intermittent generation, and the potential growth of new electrical loads are increasing the importance of electricity system flexibility. Low cost distributed storage and Demand response enabled by smart systems seem like to be key solutions. However, the local nature and regional variation of deployment of both the drivers and solutions increasingly point to the need for electricity balancing at sub-national scale. Hence the interest in DSOs or DSPs, the development of which would represent a major change in the centralised operation of the UK energy system.

Decentralisation operation does not necessarily imply decentralised governance, but it becomes an option in the way that is precluded by central system operation. This opens questions about the potential roles of devolved governments, regional institutions and even local government.

Any move away from centralised governance would be a major step and clearly would require extensive analysis and debate. Development and implementation of some concept of the distribution system operator should be taken forward as a priority.

5 Conclusions

In this paper we have developed a framework for thinking about the changing nature of retail energy services markets in the UK and mapped out areas in which the governance of such markets will need to be changed or constructed. This agenda rests on a critical analysis of the history of retail energy institutions since the 1980s, informed by an institutionalist perspective on that history.

Following privatisation and liberalization, the model for energy governance was that competitive markets were expected to achieve lower prices and better service for consumers. When new objectives arose in the 2000s, the same fundamental model with a few simple changes was also expected to deliver, i.e. security by liberalized markets

nationally and internationally, and environmental objectives through liberalized markets with a carbon price.

However, the reality has been much messier and far less successful. Even on their core function, liberalized markets did not work as expected. There have been challenges in other areas of governance as well, especially energy efficiency and fuel poverty reduction. Meanwhile, now areas of activity are increasingly opening up, with technological change and new business models and actors. Retail energy services markets are also likely to become more complex in the near future with the advent of smart metering and the possibility of domestic consumers being offered deals for demand flexibility.

Overall, there are thus two important drivers for a fundamental rethink of retail energy market services governance. One is that the existing policy approach of liberalization for fair efficient pricing plus add-ons for energy efficiency and fuel poverty has not worked, or is limited, especially in light of future needs. The other is that new technology, i.e. the advent of decentralized energy production, potentially large new electricity demands, smart metering and the possibility of demand flexibility, is changing the nature of the market itself, as is increasingly recognized by suppliers themselves (e.g. Wood 2015). At the same time, a successful rethink needs to encompass all of these issues; trying to fix one problem (say more effective competition) without acknowledging the other issues is likely to at best work only partially. To add to the uncertainty going forward, this rethink needs to happen within the context of Brexit.

We have argued that such a rethink must engage with a set of three deeply seated ideas that have shaped retail (and other) energy institutions in the UK since the late 1980s. One of these is a liberalized market paradigm; while some argue that there has been a decisive shift to a new energy paradigm, we argue that the market paradigm remains in place, but increasingly drifting from its original core under pressure of interventions brought in to try to achieve the trilemma of energy policy objectives through shaping investment, innovation and consumer engagement. A second is the 'supplier hub' principle, which has given suppliers considerable influence over the delivery of policies. The third is a model based on centralized flexible supply. One important outcome of this situation is that new interventions have not displaced existing ideas and institutions, but rather have been 'layered' on top of them, leading to complex unanticipated interactions and, often, incoherence. One lesson that we draw from this approach is that in order to rethink retail energy services institutions, we must radically challenge all three of these underlying ideas.

We then go on to consider the nature of activities in existing and emerging energy services markets. Retail energy supply (kWh), especially for domestic and SME consumers, is a licensed activity and although prices are not regulated, there is a great

deal of regulation to protect consumers. It remains dominated by a few large utilities, with activities concentrated in being an intermediary between wholesale markets and aggregated individual demands, and in billing and metering. By contrast, the new energy services markets have involved many more types of actors, and a range of different activities, especially the facilitation of investments by households, a range of specialist installations, new smart operations involving much richer data flows, and aggregation in new markets for flexibility.

Overall, our analysis points to a reform agenda that has a number of dimensions:

- One relates to competition and regulation, where we argue for treating kWh supply differentially from other energy services markets. The option of re-regulation of prices should be considered for the former, where competition in the provision of an undifferentiated commodity has been, at best, only partly successful. But it is essential that maximum market access and competition be ensured in the latter, which means a decisive step away from the supplier hub principle.
- A second relates to forms of ownership. UK regulation has been established on the assumption of profit-maximising companies. Whilst this is the dominant model, the notion of principle based regulation should allow for consideration of different rules for organisations that are not profit maximising corporations.
- A third follows immediately from a more critical approach to the supplier hub principle: i.e. the need for policy makers and regulators to pay more attention to and give more support to actors other than licensed suppliers (and especially the Big 6) offering innovative products, technology installation and financing. Policies in these fields should be more neutral with respect to actors, many of which are non-energy businesses. Policy makers should seek to allow a range of such actors to promote innovation and embed responsibility for that change more clearly in the relevant economic sectors.
- The reasons to be concerned about monopoly companies entering competitive markets were understood at the time of market liberalisation and have not disappeared. However, network operators are increasingly key actors in some necessary changes, especially in the electricity system. Whether this is in the direction of more local distribution system operation (DSOs) or in providing local market platforms as 'distribution service providers' (DSPs), they need to be incentivised to become more active in their management of their systems, a change which inevitably bring them into contact with a range of new market participants, including households and SMEs. They also need a widening of their remit, for example in areas such as storage, through changes to regulation.

Better coordination of governance across networks and markets will be required make these changes work.

- Finally, while decentralised energy production, flexibility and trade does not necessarily imply decentralised governance, it becomes an option in the way that is precluded by central system operation. This opens questions about the potential roles of devolved governments, regional institutions and even local government. Any move away from centralised governance would be a major step and clearly would require extensive analysis and debate.

There is now an active debate on these issues across energy policy circles. While some will disagree with our particular proposals, this paper is intended to contribute to that debate, especially in offering an agenda based on an solid evidence base and a theoretically informed analysis. We welcome comments and feedback.

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ⁱ The primary objective of UKERC Phase 3 (2014–19) is to explore the UK energy transition in an uncertain world, and the synergies and trade-offs between the key drivers for this transition. The core research programme of UKERC Phase 3 contains six themes, of which Theme 5 is entitled “Key challenges in energy system decision-making” and its first sub-theme (of which this work forms a part) addresses “Governance and key challenges at the energy system level”, which investigates in particular the challenges arising from the ‘energy trilemma’ of affordability, security and environmental protection.

ⁱⁱ Energy institutions in Northern Ireland have always been different for both geographical and political reasons. Since the Anglo-Irish agreement they are increasingly part of ‘All Ireland’ arrangements. The analysis in this paper therefore principally concerns GB markets and institutions.

ⁱⁱⁱ Offer and Ofgas, merged in 2000 to create Ofgem.

^{iv} Here we use the term ‘decentralised’ electricity generation rather than the more conventionally used ‘distributed’ generation. While the latter is used in a technical sense to mean generation from plants connected to the distribution network rather than the transmission network, by the former we mean electricity produced by actors who are not selling into wholesale markets.

^v This is not unique to the UK and has been seen elsewhere, including Germany, Denmark and Spain, amongst others

^{vi} British Gas is offering smart home energy management through the ‘Hive’ system; RWE Npower is offering the Nest thermostat

^{vii} E.g. Tempus Energy, which while mainly focused on the commercial sector, does already have some domestic customers.

^{viii} Costs of policies on bills are estimated to be 4% on gas bills, 10% on electricity bills and 7% on dual fuel bills. The net costs of ECO in 2014 are estimated at £19 on the average underlying gas bill of £832, or 2.3%. The net costs of ECO (and Green Deal administration) on electricity bills is £7 on an underlying bill of £778, or less than 1%. The cost of the FiT on electricity bills is £9, or 1.2%.

^{ix} In contrast to this ideas-based view of privatisation, another, more interest-based interpretation is that such arguments were a justification for a decision that was more driven by the aims of reducing government debt by selling assets, and of strengthening political support for the Conservative Party by creating a nation of shareowners (Rutledge 2010a). However, it is also the case that, even if ideas about the efficacy of markets was a post hoc justification for privatisation, these ideas did then become dominant in shaping the subsequent evolution of energy policy in the UK.

^x This was originally the AEP, joined later by the UKBCSE, which were merged in 2010 to form Energy UK

^{xi} In the economics literature on market structure and innovation this is known as the ‘replacement effect’ (Arrow 1962, Reinganum 1983)