Governing for Innovation, Sustainability and Affordability: An institutional framework

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November 2016

UNIVERSITY OF EXETER

EPSRC
Engineering and Physical Sciences Research Council

www.exeter.ac.uk/igov

1. Introduction: the challenge of transformation of the energy system

The energy system in Britain, like others around the world, is undergoing fundamental and rapid change due to a wide range of different drivers, from technology through to social, environmental and businesses preferences and innovations (Mitchell 2016).

The drive to decarbonise electricity over the last 30-40 years has led to a significant rise in renewable generation, especially from wind and solar, and this has had significant impacts on how energy systems are operated and managed. As these technologies continue to expand as their costs come down, the value of flexibility elsewhere in the system will also grow fast. Existing forms of flexibility, such as natural gas-fired power plants, will become increasingly unavailable as carbon budgets get tighter. As a result, flexibility in demand for electricity, either through demand-side response or through forms of storage, is becoming increasingly important.[1]

Electrification may play an increasing role in transport and heat (DECC 2013b: 102-105), which may mean a significant increase in the demand for electricity, including peak demand. Wilson et al (2013) estimate that shifting even 30% of heat demand to electricity would mean daily electricity demand doubling if resistive heating is used, and increasing by 25% if heat pumps are used. Peak demand increases would be larger. While these developments, were they to happen, represent a huge technical and economic challenge, they also open up opportunities, since demands in electric vehicle charging and electrical heating are particularly well-suited to demand side management. In the absence of demand side flexibility, the costs of this transformation in terms of additional generating and network capacity will be enormous, again underscoring the value of that flexibility. However, it remains very unclear whether decarbonisation of heat and transport can (should or will) be achieved by this electricity route, or how far renewable gases may also be involved (Maclean et al 2016). These developments also point to the importance of demand reduction since the costs of system transformation will be lower the lower is total demand (Steward 2014).

A further dimension of transformation is that the rise of small-scale technologies (including many renewables), again (currently) especially in electricity generation. Britain is seeing a sharp rise in distributed generation (DG),[2] and the beginning of the reversal of the centralisation of the electricity system in the 20th century. Crucially, 21st century energy systems are expected to be more *decentralised*, with households, businesses, local government and other organisations taking back more control over energy production. It is also likely that we will see more heat being provided

[1] For more details see: http://www.sustainabilityfirst.org.uk/index.php/energy-demand-side/gb-electricity-demand

[2] i.e. generation attached to the lower voltage distribution networks

through local heat networks, rather than through burning gas delivered through a national network, especially in cities.

The emergence of a decentralised energy system, involving variable renewable power, more distributed generation, flexible demand including transport and heat, storage, interconnectors and interactions between electricity and renewable gas , will be made possible by the much deeper application of integrated ICTs across the system, in networks, meters, appliances, lighting, heating and cooling technologies, and in generation. These present the possibility of optimisation of energy and power flows at local levels, including the operation of virtual power plants composed of many different sources of generation, storage and demand response.

The changes that the energy system is now facing add up to a shift away from a supply-oriented, centralised system to a decentralised, smart, demand-focused system (Willis 2006). Some elements of this shift are already under way, with increases in renewables, the rise in DG, new business models for demand side response, and local authorities setting up energy companies. Interesting technical work is being done, for example in the Smart Grid Forum[3] and the IET's Future Power Systems Architecture initiative[4].

However, the most fundamental challenge in this transformation is not technical, but rather one of governance, and specifically inertia within governance (Mitchell 2014).[5] As we discuss further below, the current institutional framework for energy in Britain is not fit for the purpose of facilitating innovation and transformation. Transforming this framework is vital because of the risk that as technology races ahead infrastructure and regulations lag behind, thereby undermining (or even blocking) its use and potentially increasing the costs, undermining the security and threatening the low carbon transformation itself (Mitchell 2014).

A key challenge here is how to decarbonise the energy system without major disruptions to energy security or affordability. Disruption is often talked about in an innovation sense as positive, for example in relation to new technologies like solar PV enabling new ownership patterns and new economics, which are having major effects on conventional utility finances. However, at a system level, disruption can also be costly. We argue that if the current GB governance framework continues as it is, and is not reformed then, at some point, major disruption will occur to the GB energy system. We argue that, while a degree of disruption in major transformations is inevitable,

[3] http://uksmartgrid.org/

[4] http://www.theiet.org/sectors/energy/resources/fpsa-project.cfm?origin=reportdocs

[5] See IGov blog post Overcoming inertia is the key to unlocking a sustainable energy future, 12 January 2015. Here governance is taken to mean policies, institutions, rules and incentives (i.e. the rules of the game).

such disruption can be managed and minimised if a new institutional framework is implemented in the near term, and if it is set up to be nimble and flexible so that it can re-set to meet new requirements easily.

This means developing the capabilities not only to make the right decisions at any one time, but also the need to be constantly vigilant about the unforeseen impacts of policies, and then being prepared to make changes to counter those unforeseen effects. The governance of the German Energiewende shows precisely these attributes.[6] It also illuminates the push and pull of policy. For example, a combination of events led to an increase in the use of lignite and hard coal in Germany from 2009, the opposite of what was intended in the Energiewende. This then led to a determined policy push from the German government to get back on track. As a result of that policy resetting, and the potential forced early closure of coal plants, the fight between the 'old' and 'new' energy system in Germany has become focused on coal. Current German Government policy seems determined to shut coal plants within a certain time frame so that the mothballed gas plants become economic again but no-one should underestimate the policy determination required to follow this through, and even then, no doubt, this will lead to other unforeseen impacts which will require more policy resetting.

The importance of the governance challenge in energy is now being increasingly recognised, and there is an active debate on the kinds of institutional changes that may be needed. For example, the House of Commons Energy and Climate Change Committee (ECCC, now folded in to the Department of Business, Energy and Industrial Strategy (BEIS) Select Committee) and the now-defunct Department for Energy and Climate Change (DECC, now part of BEIS) have raised the possibility of creating an independent system operator. Some distribution network operators (DNOs) are taking first steps towards becoming more active distribution system operators (DSOs). The recent reports from the National Infrastructure Commission (NIC) and the ECCC have highlighted the challenges and opportunities for creating a low carbon network infrastructure, and suggested that the challenges can only be met with an appropriate governance, regulatory and operational framework.

This paper provides a set of principles and options for a new institutional arrangement which, we consider, better manages the required transformation whilst at the same time trying to reduce energy system disruption. Our approach has been developed through a four-year project on Innovation, Governance and Affordability for a Sustainable Secure Economy (IGov) at the Energy Policy Group at the University of Exeter, funded by the Engineering and Physical Sciences

[6] See the IGov blog post Managed disruption – the push and pull of policy in Germany, 22 April 2016

Research Council. This Briefing Note only provides a headline summary of the institutions and their role, and a brief rationale for thinking. However, we have written a number of blogs, working papers and journal articles about the governance needs of the GB energy system in general, and its constituent parts. For further details on the approach and earlier version of the proposed framework see the IGov website.

2. Governing for Innovation

Our proposals involve the creation of some new institutions, and changes in the nature of existing ones, such as a refocusing of the role of the energy regulator, Ofgem. A common concern about institutional change in the energy sector is that it is too frequent and sometimes is not worth the cost and disruption involved, with uncertainty causing delays in investment. We are aware of these arguments, but would emphasize two points.

Firstly, what we are suggesting here does not constitute significant or disruptive change. It is actually a combination of what we already have and governance arrangements already in place in other places, such as Denmark and New York State in the US. Moreover, by confronting the problems of the current framework, it is saving GB from greater disruption in the future.

Second, under conditions of technological change, the potential benefits of a more flexible, demand-focused and decentralised energy system over our current approach are enormous. For example, the National Infrastructure Committee recently estimated that a smart energy system involving more interconnection, storage and flexible demand would save consumers up to £8bn a year (NIC 2016). In this context, the cost of institutional change that will be needed to deliver such savings in practice – which are likely to be of the order of tens of millions pounds at most – are relatively minor.[7] This will require an investment in terms of the design of institutional change, but this investment will lead to quick returns in comparison with problems that governments will otherwise have to deal with in the form of an increasingly expensive and dysfunctional energy system.

Overall, it is essential that we find ways of transforming the energy system that are affordable for people. It is also right that we seek to transform the system in ways that allow ordinary citizens to take back control of energy and to place them at its centre.

[7] See also IGov blog post Restructuring GB's energy institutions – why it is worth the cost, 18 April 2016

3. The existing institutional landscape (and why it needs to change)?

The British energy system is already undergoing a number of changes, many to do with decentralised technologies and the demand side, or those occurring at the distribution level from the bottom up. While some of these changes are being driven by aspects of the current governance framework, this is typically happening in an uncoordinated, volatile way – support to solar PV and associated network problems would be one example;[8] another would be the apparently unforeseen interaction between the Capacity Market and embedded benefits for DG, and what is an essentially dysfunctional response to that interaction.[9] In many other cases, current governance is actually blocking change, for example the virtual absence of a strategy on energy reduction, in stark contrast to Germany and Denmark.[10] Overall, current governance does not complement the technological, business and social changes underway, and change that is occurring is often happening in spite of, rather than because of, that governance. In this section, we assess the existing institutional landscape, and ways in which it is failing to fulfil certain key functions.

In the current institutional landscape, the ***Committee on Climate Change (CCC)*** provides advice to Government on the science (and state) of climate change, recommends carbon budgets, and produces analysis of ways to meet those budgets. The Committee, and more widely, the targets laid out in the Climate Change Act, are supposed to provide both long-term direction and independent expertise, through delegation of target setting away from short-term politics (Kuzemko 2015). However, in practice, politics has not been removed from the setting of carbon budgets, or, more importantly, from the implementation of policy to meet those budgets (Lockwood 2013). The CCC has to walk a politically sensitive fine line between setting out GHG reduction needs, recording the extent to which various policies have worked in reducing the GHG emissions, and explaining how further reduction can be achieved on the one hand, while at the same time not explicitly making policy. The CCC is not meant to take a view between different technological or social pathways; rather it is only meant to show the various ways in which carbon budgets can be met cost-effectively.

[8] See, IGov blog post Solar surprise, revisited, 6 May 2016,
[9] See IGov blog post The embedded benefit saga, 8 August 2016,
[10] Kuzemko (2016) and IGov blog post Germany's €17 billion energy efficiency strategy – where's ours? 19 May 2016

This arrangement constrains both the Committee and the nature of the debate because, at the moment, Britain lacks a formal home for transparent discussion about climate and energy policy and for reaching consensus on potential policies and decisions.[11] It is often argued that the near unanimous support in Parliament for the 2008 Climate Change Act means that its climate targets enjoy strong and wide support. However, there are good reasons for doubts on both of these dimensions (Carter 2010, Lockwood 2013), with the low salience of climate change in particular being a major problem. One response, which appears to be that taken in Britain currently, is to make decarbonisation policy on the basis of societal and political consent, i.e. adopting and maintaining policies unless and until they run up against strong opposition from particular constituencies, when they are abandoned.[12] While this approach may appear politically realistic, the danger is that it will run into limits on decarbonisation – not meeting the required CCC budgets - as the scale, nature and costs of decarbonisation policies intensify.

In addition, the Committee offers mainly high-level, broad advice on policy options. Its conclusions do not connect with the detail of institutions and regulation.[13] Perhaps reflecting this situation, the expert capacity of the Committee lies mainly with climate scientists and economists rather than with the details of energy policy.

In theory, the current arrangements then mean that the Government takes high level policy decisions. Here, there are two critical issues. One is whether the officials (previously in DECC, now in BEIS) advising political decision-makers have the expert capacity to develop policy well, given the exodus of expertise following privatisation. The incentive structure of the British civil service, rewarding generalists over specialists, is a problem here. In practice, the government has been quite heavily dependent on the energy industry, especially large incumbents, for both expertise via secondments and co-design processes,[14] and for data. Such arrangements clearly increase the risk of capture.

[11] The House of Commons Energy and Climate institutional terms. More recently, the National Infrastructure Change Committee does provide a platform for debates on energy and climate policy, but is weak in formal Committee has been created, which also covers relevant aspects of energy transformation, which has more power. However, the NIC does not aim to generate a broad consensus.

[12] The most obvious example is support for on-shore wind.

[13] For example, energy industry codes are the detailed rule books for energy markets and networks, and need to be changed to reflect policy objectives, but at the moment there is direct link between CCC recommendations and code changes, and no requirement on code administrators or panels to ensure that they enable the meeting of the CCC recommendations (see Lockwood et al 2015). See also the IGov blog post Putting the environment back into GB energy policy – stop being complacent about emission reduction, 31 May 2016,

[14] For example, the details of the Capacity Market were effectively co-designed through the 'Collaborative Development' process – see https://www.gov.uk/government/groups/electricity-market-reform-emr-collaborative-development

A second is that, in practice, policy making has over time become partially taken on by other bodies. This has happened through the institutional arrangements set up following privatisation, whereby the delivery of energy goods, services and some policy objectives was to be achieved through markets, or through regulation handled independently at arms-length from government. The argument was that the delegation of regulation and delivery through an 'independent' energy regulator (i.e. Ofgem) and thence to regulated industry actors beneficially 'de-politicised' energy (Kuzemko 2015). This also means there is no meaningful control of 'direction' of energy system change, as well as reduced political space for debate and discussion about what that direction should be and how to get there.

Ofgem was initially set up as an economic regulator responsible for overseeing market and network regulation, with the aim of ensuring that the energy system operated in a competitive and cost-effective way. However, over time is has taken on other social and environmental responsibilities through a whole series of changes to its remit and duties, and more recently intended to be through a Strategy and Policy Statement.[15] This drift in the remit of Ofgem has led to two consequences.

One is that Ofgem now, in practice, is expected to make decisions on trade-offs between policy goals in how it enforces and interprets regulation; trade-offs that are essentially political and which it is not institutionally equipped to manage. There are many grey areas in the relationship between the regulator and the government. Many decisions that should be in the policy sphere, and ultimately decided on by the Secretary of State (SoS), have drifted by default into the regulatory sphere. For example, new technologies are opening up multiple pathways to meet Government climate policy goals. The choice of one rather than another technological pathway has important distributional implications for different sections of society (including the relevant industries and supply chains), its total costs and its speed of transformation. Technology pathways are heavily influenced by deployment support frameworks set by Government. But decisions on surrounding regulation within Ofgem's control – including those on the design of network charging, industry codes, balancing market design and incentives for distribution networks – also matter. Through its executive authority the regulator is now making a multiplicity of *de facto* policy choices which have impacts on a range of issues, including the relationship between transmission and distribution levels in electricity, centralisation vs. decentralisation of the energy system, the existence and availability of local markets and the involvement of customers. This situation has undermined the transparency and legitimacy of energy policy.

[15] See IGov blog post The odd couple – will a new Strategy and Policy Statement help sort out the relationship between government and Ofgem?, 18 August 2014,; IGov submission to DECC consultation of Strategy and Policy Statement, October 2014

Moreover, because Ofgem has been slow to respond to its new duties, especially through the 2000s, there has been a degree of regulatory inertia. A commitment to the idea that intervention should be minimised that came with the free market paradigm at the time of privatisation and liberalisation has endured, which has slowed and hampered policy to support innovation in networks, for example (Lockwood 2016).

A second consequence of the drift in Ofgem's role is that it has become an over-large bureaucracy with reduced internal coherence and multiple responsibilities that it is not always well-equipped to handle. It has hundreds of staff, compared for example, with the 45 working Denmark's regulator which has a much clearer, narrower remit of economic regulation.[16] Its roles are constantly in flux – for example it has recently been decided to separate out the E-Serve environmental and social programmes delivery role into a new body,[17] but it is taking on greater powers in the area of code governance.

Overall, the context within which the regulator operates and makes decisions has changed dramatically since it was set up, and its role should be rethought. We think the answer is to scale back Ofgem back to be a minimal economic regulator and by re-assigning the social, environmental and security responsibilities elsewhere.

A significant amount of *de facto* decision making in electricity has also been delegated to National Grid as the joint transmission and system operator which has, similar to Ofgem, seen a gradual expansion of its role in areas such as recommending targets for capacity auctions. This arrangement is problematic because there are too many conflicts of interest within NG at a time of fast changing and decentralising energy technologies, and because Ofgem has struggled to regulate system operation appropriately through commercial incentives (Strbac et al 2014).

There are further reasons for rethinking the role of the system operators, in both electricity and gas.[18] With essential technical expertise and knowledge of the details of the system, system operators are key actors for the delivery of the ***transformation*** of the energy system towards a low-carbon, more decentralized and more flexible future. However, at present system operation focuses almost entirely on the transmission level, whereas the major transformations are likely to come at the distribution level, nearer demand (see below). This imperative implies abandoning the old separation between transmission and distribution in system operation, because in future a lot

[16] See IGov blog post Lessons from America: If only GEMA was more like a US Public Utility Commission, 4 July 2014; Lockwood (2015a)

[17] See https://www.ofgem.gov.uk/system/files/docs/2016/03/simplification_plan_2016-17_0.pdf

[18] See IGov blog post Not just independent but also integrated, 4 March 2016

more of the balancing of the system through local generation, storage and demand management will be happening at the distribution level. This may be achieved through distribution service provider platforms (see below), but these need to be coordinated with the national SO. Until recently, the SO has had virtually no visibility of what is happening below the grid supply point.

At the same time, both transport and heat are likely to become at least partly integrated into the electricity system. The future of the electricity system is bound up with the future use of gas, and the gas network, and indeed gas system operation. At the same time, it is becoming clear that we will need more heat networks in the UK, and that these should be regulated. In Denmark, where district heating is widespread and involves combined heat and power, electric boilers, heat pumps and heat storage, heat and electricity are intimately intertwined. Especially during a transition, the evolution of electricity, heat, transport and gas should not only be thought about together, but also the operation of the systems should fit together. This implies new system operator and Regulator roles.

Yet another area where decisions on the detailed rules of the energy system have been delegated, this time largely to industry itself, is industry codes. The current code governance system is overly complex and opaque, and not fit for the purpose of transformation, being prone to inertia, capture by incumbent interests, and not sufficiently connected with over-arching policy goals (Lockwood et al 2015).[19]

The delegation of policy making, regulation and delivery to different bodies has led over time to a highly fragmented and complex institutional system for energy (**Figure 1** below shows the actors and relationships just for electricity). These characteristics mean that the coordinated changes across different spheres of policy, which are needed for a rapid and cost-effective transformation, are extremely difficult. Policy making is nowhere near nimble enough to take account of rapidly changing technological developments and costs. Unintended consequences and unanticipated interactions between policies are commonplace. This state of affairs is widely recognised, with a number of calls for some form of system architect.[20]

The coordination problem is worsened by the lack of open and transparent access to data. With the growth of ICTs in networks and the roll out of smart meters and appliances, data will play a central role in the future energy system, and access to it should be a public good. Yet it currently does not flow sufficiently to guide effective investment strategies; for example, investors in storage

[19] In October 2015, an IGov workshop was held on codes governance with key stakeholders; for further details and presentations see: http://projects.exeter.ac.uk/igov/category/events/igov-events/code-governance/, and IGov (2015) for a summary of the discussion.

[20] See IGov blog post The belly of a (system) architect, 27 May 2014

do not know where their potential services to distribution network operators would best be located because of a lack of data. The current approach to data from smart meters is to privatise it through the creation of the Data Communications Company[21] which will make access to data conditional on payment. In its recent Energy markets investigation, the Competition and Markets Authority recommended that Ofgem create a secure domestic customer switching database that would be available to all suppliers, which is a step in the right direction, but still falls short of fully open and transparent data on energy services.

As discussed above, much of the forthcoming change in the energy system will come on the demand side, and at the local level, through new types of services (potentially including both heat and mobility). At present, there are no local energy markets in GB; no way for new actors to sell energy directly to local customers. Markets for services to distribution network operators (DNOs) such as storage and demand response are also very basic. There are multiple issues in the construction of such markets (Lockwood 2014). Incentives for DNOs to be more proactive in this area are still relatively weak.[22] There is some thinking going on about these issues in GB, for example in the Smart Grids Forum, but current institutions do not offer a clear way forward.

Finally, current policy views end users as consumers very much in terms of traditional sectoral distinctions, i.e. domestic, commercial and industrial, rather than in terms of how able or willing they are to engage with the system, as is now happening in other countries.[23] A mass market approach to service still prevails in energy, in contrast with other sectors where service is now far more personalised. The idea that end users could offer services to the system, for example via microgeneration or demand side response, and should receive value for those services, is still in its infancy, and very much at the margin of the system rather than at its heart.

This latter dimension will become increasingly important as available technology, new businesses models and change in social practices allows each person to be treated individually, ranging from those who are very active i.e. prosumers, through to those that are unable or unwilling to act. End users can be thought of on a continuum from 'empowered- engaged-essential'.[24] The current conception of engagement, which is largely about switching, does not capture this.[25]

[21] A wholly-owned subsidiary of Capita

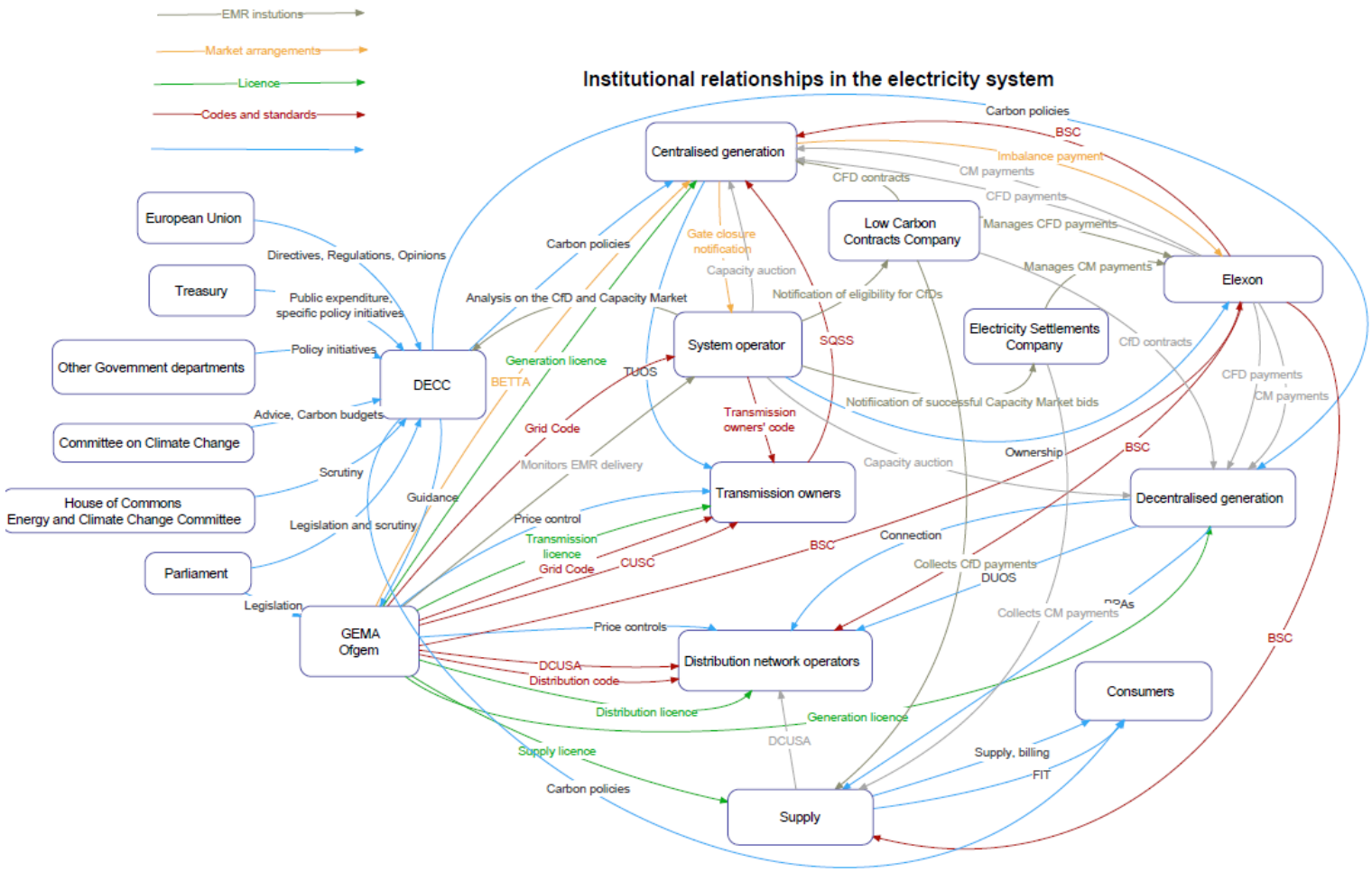
[22] See IGov blog post Transformational regulation – comparing the NY REV and RIIO, 11 August 2016

[23] For example in Australia –see CSIRO and ENA (2015)

[24] See IGov blog post *The changing role of consumers in the energy system*, 8 July 2016, http://projects.exeter.ac.uk/igov/new-thinking-the-changing-role-of-consumers-in-the-energy-system/.

[25] See IGov blog post *Switched off – is switching really a measure of consumer engagement?*, 12 November 2013, http://projects.exeter.ac.uk/igov/new-thinking-blog-switched-off-is-switching-really-a-measure-of-consumer-engagement/

Figure 1



Source: Woodman, 2015 https://blogs.exeter.ac.uk/energy/2014/11/12/mapping-the-power-in-the-electricity-system/

4. Principles for institutional reform

Above we argued that the governance of the British energy system is not fit for the purpose of facilitating rapid change to greater sustainability at the lowest cost, and needs institutional reform. In this section we lay out the basic principles for that reform, especially in terms of the functions that are required from a new institutional arrangement. In the following section, we then go on to propose a particular set of options that we believe meet these principles.

Before proceeding to specific principles, it is first useful to note two general aspects of our approach. The first is that our principles are shaped by political analysis, and in particular the influence of both interests and ideas in shaping how institutions work. Large incumbents in the energy sector deploy power resources, including lobbying, to influence policy design, and sometimes succeed in capturing the policy process. Ideas, especially ideas about the universal efficacy of markets, have also been very influential in energy policy, and remain so. We have tried to take these factors into account in the discussion of principles below.

We are also aware of the dangers, discussed above, of unintended consequences arising from institutional design, and of interactions between policies and institutions. Again, we have attempted to anticipate some of these issues, in part by thinking about institutional change in a holistic, system-wide way, and in part, as discussed above, by placing emphasis on building the capability of institutions to be adaptable and responsive.

The still-strong commitment to markets in energy policy relates to our second general point. In what follows, we argue for institutional changes that do involve the coordination and direction of energy policy, and intervention in markets. However, it is important to emphasise that our proposals are not 'anti-market'; indeed they are aimed at making markets function more effectively for transformation, ensuring that they open up opportunities for new technologies, actors and business models. However, unlike a number of recent commentaries which argue for a number of 'first best' policies (e.g. Keay et al 2012, Helm 2012, Bird 2015), we recognise that institutional design must engage with markets as they are, rather than some unattainable ideal.[26] Moreover, even if one was to accept the ability of 'first best' policies, the time required for them to evolve to the necessary sophistication would be far too slow to meet the required emission reductions.

[26] For example, it is not particularly useful to simply reassert that what is needed is effective carbon pricing that reflects the social costs of climate change; it has long been clear that the political economy of carbon pricing is such that this cannot be delivered.

Taking these preliminary points into account, we propose the following principles for institutional reform for a sustainable, secure and affordable energy system, and these are further discussed below:

- Starting with, and centred on, end users
- Facilitating local markets
- Open and transparent access to data
- Greater co-ordination
- Long-term political stability
- Transparency and legitimacy in policy making

4.1 Starting with and centred on, end users

The first principle is that an agenda for institutional reform that aims to reorient the energy system towards the demand side above all has to place people at the centre, with changes to institutions following from this starting point. A number of other points follow from this basic principle.

First, in contrast to the current approach of poor quality, mass-market customer service, policy should create incentives for personalised service and interaction. The energy system should be run in such a way that it fulfils people wishes, rather than consumers having to fit into the wishes of companies and the regulator wishes, but which also provides a better service in terms of system operation cost.

Second, unlike the current categorisation of end users as consumers by sector and size, people should be seen in terms of the degree of their engagement and of the vulnerability of their circumstances, where it is recognised that both of these will change as they move through the life-cycle and as the economy changes.

The degree of engagement of people is the new dimension, and so is important to emphasise. This goes far beyond the numbers who switch suppliers, which is at the centre of the current debate. End users will make or break the move to a smarter and sustainable system; many of the changes that are occurring are on the demand side, and as such are close to people. The energy system therefore needs to become more facilitative of what they want in respect to energy consumption, energy production and energy services, enabling those who want to be active players to become so, whilst protecting those that are unable, or unwilling to be active. Efforts to connect people with the possibilities for energy use, services and production are therefore essential, including ‘conversations’ about energy with end users in some form.

The area of greatest interest is not energy per se, but rather energy services, both for the end user and *from* the end user to the system. The last of these is the newest and also the most important in future. Here there are three functions that a new system must deliver. Firstly, ensuring that people can get a fair value for services that they offer the system (most probably through some form of new markets or tariffs). Companies and policy makers must start to view end users as a source of system services, for which the customers are paid and which potentially negates the need for additional infrastructure capacity elsewhere. Secondly, precisely because these are new markets, there is a need to establish trust, credibility and legitimacy. Thirdly, where there are market failures, designing effective interventions to address these will be needed.[27]

4.2 Facilitating local markets

Currently, virtually the only markets we have in the sector are essentially national markets for energy. With technological change (including within ICT) and cost reductions, energy production will become increasing decentralised, allowing the possibility of truly local energy markets, and an approach centred on people means ensuring that this possibility is made available to them in some form. At the same time, smarter electricity grids and meters open up the possibility of a whole new set of system service markets (including frequency, voltage, possibly reactive power, reserve), and a greater balancing of demand and supply at the local level.

If we want to see local markets for energy and energy services formed rapidly and successfully, then some form of coordination through local platforms and setting of market rules through regulation will be necessary. This process will also allow the coordination of local markets with national ones, and the linking of local and national system balancing.

4.3 Open and transparent access to data

On the demand side, the current energy system is all about static estimates, whereas the future energy system will be all about data, at least half hourly if not real time. Data will be central to the new markets and services. Making data acquisition costly and difficult will slow the development of these markets and services; making data openly accessible and free will accelerate their formation.

A related issue is need for the monitoring and analysis of data to ensure fair market operation, strictly subject to the legislation on data privacy. The need for such a function arises out of the principle of placing people at the centre (see above). Only if market data is available to the regulator, and the regulator has the capacity to analyse that data effectively, can people be assured

[27] For example, there are likely to be externalities in demand-side response markets (ENA 2014). Equally, it is well-known that demand for energy efficiency suffers from a number of problems, including a bias against capital spend, information costs and uncertainty amongst consumers about benefits.

that large incumbent actors are not exercising market power. The recent CMA inquiry has highlighted the inadequacy of GB market monitoring.

4.4 Coordination

A people-centric focus and the development of local markets are essential principles, but enabling and adapting to change efficiently also requires coordination of policy making at a higher level, to minimise unintended and problematic policy interactions and to take macro-decisions in areas such as the future of national networks. As is emphasised in debates on the concept of a system architect, this does not mean central planning or micro-management (IET 2014). But it does mean some form of institutional arrangement through which decisions about how different parts of the system, including markets, should fit together can be taken, and then implemented. At the moment, as discussed in Section 2 above, this function is missing. Since the energy system is also highly complex, technical expertise will be a crucial requirement for whichever institution leads this process.

4.5 Long-term political stability

A major driver of energy system transformation is the urgent need to decarbonise the economy. Yet climate change is a long-term problem whose major impacts will affect future generations, while many of the costs involved in decarbonisation are up-front,[28] making this a politically difficult task. Achieving a degree of long-term stability in the direction of policy is therefore crucial. As discussed above, our main means of achieving this stability currently is through the Committee on Climate Change, which is limited both in the degree to which it can lead a transparent discussion about climate and energy policy to achieve a deep societal consensus on the direction and speed of travel, and in the degree it can connect high level carbon budgets with details of policy and regulation.

The issue of societal (and therefore political) consensus is particularly important. Above, we argued that as we move into a phase of deeper and more far-reaching transformation of the energy system, the approach of policy-making by consent may not be sufficient to maintain momentum, and that a more pro-active approach to assessing and building consensus may be necessary. In countries with proportional representation and frequent coalition governments, including Denmark and some other continental European countries, such consensus tends to be generated with the political process itself. In the UK, with its first-past-the-post electoral system and single-party governments, the

[28] Although these can be met in a variety of ways, and do not all have to be placed on current consumers of energy - see, for example, Lockwood, M. 'Paying for climate policy: the case for long-term public borrowing' *Juncture* (on-line) (26 September 2013), http://www.ippr.org/juncture/171/11321/paying-for-climate-policy-the-case-for-long-term-public-borrowing

political process tends by contrast to produce policy instability (Lockwood et al 2016).[29] The question is therefore whether greater stability could be reached through an alternative process. Such a process would have to bring together representatives of all major societal groups, but also, to give it legitimacy and political effect, the leaders of political parties as well. These actors would then have to negotiate a way forward that arbitrated between their different positions, and with information on the costs and benefits of action.

4.6 Transparency and legitimacy in policy making

Finally, energy policy making has suffered in recent years from an erosion of transparency and legitimacy in policy making, in part through extensive delegation to a range of different quasi-public and private actors, with attendant risks and, importantly perceived risks, of incumbent capture. To restore these crucial qualities, there needs to be an institutional pathway from decisions taken in the political sphere to the details of policy making that is clear to the average citizen.

In summary, what is needed is a whole system approach to governance, based on legitimate direction from the top, optimisation of supply and demand from the bottom up, and then middle out facilitation through system and market institutions.

5. An option for institutional change

Above we argued for a set of principles for shaping institutional reform in the British energy sector. To further stimulate debate, and reflecting our more detailed thinking, in this section we also offer some more specific proposals for how such principles might be operationalised. These represent one option for institutional reform.

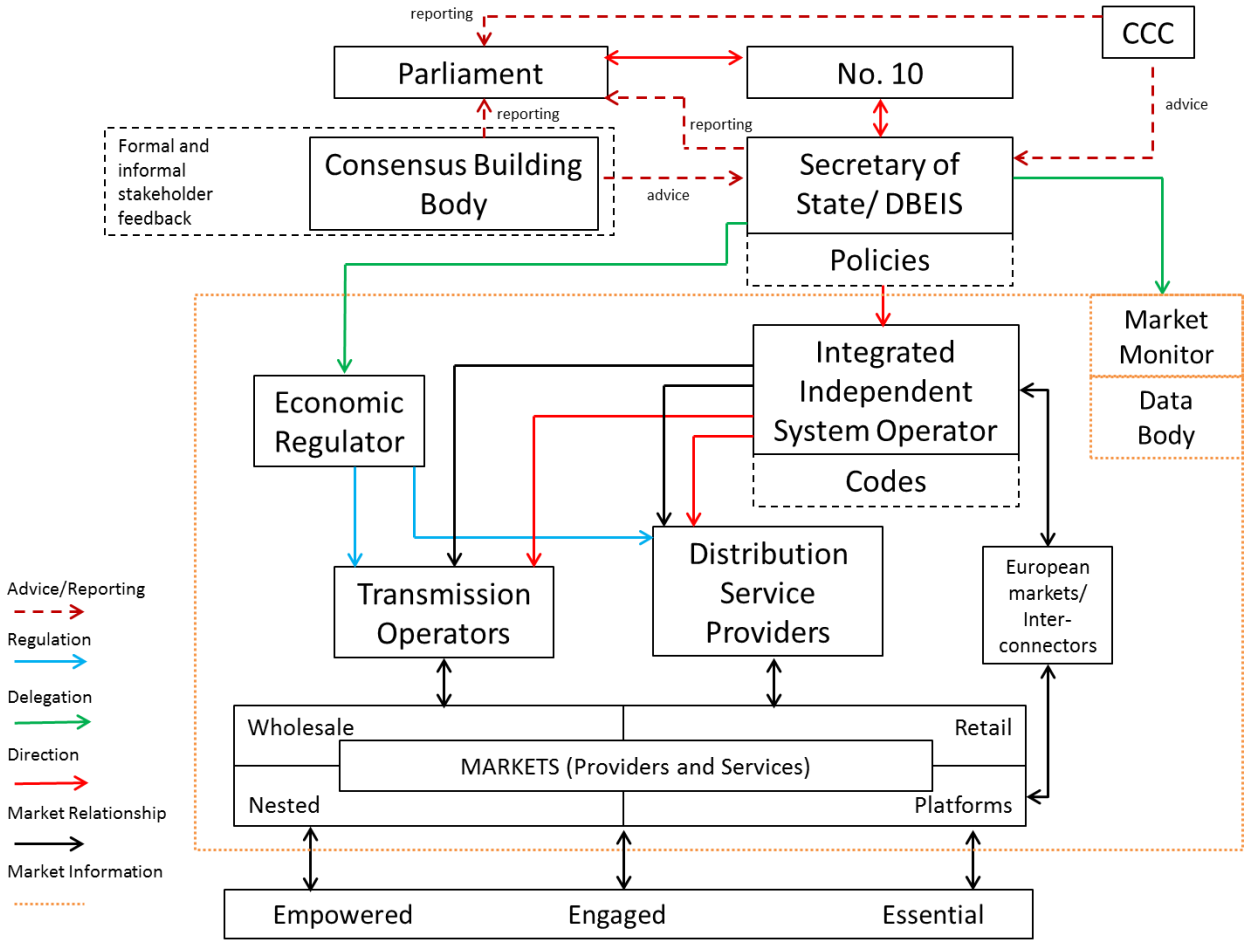
These proposals take the form of a specific set of institutional arrangements, as shown in Figure 2. Within this new framework we have set out changes to some existing institutions, as well as the creation of some new institutions. As noted above, in our view what we are proposing does not constitute significant or disruptive change; rather, it is a combination of what we already have and governance arrangements already in place in some other places, including Denmark and New York State in the US. The nature and role of each body, and the relationships between them, are described below.

[29] See IGov blog post, First-past-the-post Politics is a Major Barrier in GB to a Legitimate, Long term Energy Policy Framework, 2 April 2015, http://projects.exeter.ac.uk/igov/new-thinking-first-past-the-post-politics-is-a-major-barrier-in-gb-to-a-legitimate-long-term-energy-policy-framework/

5.1 End Users

Above we argued that a new governance framework should start with and be centred on people, as end users, consumers, customers, citizens, etc. To build and offer legitimacy, credibility and trust we support the introduction of a Social Licence for all energy institutions and actors. We expect people to be able to capture a fair part of the value of any services they can offer to the system via the DSP markets (see below). Moreover, we support 'conversations' about energy with end users. Funds have to be available for this and should be bid for by those which wish to undertake the conversations. We propose that Citizen's Advice would have control over those funds which could be bid for by local authorities, small communities or companies. We also think DSPs (see below) should be enabling 'outreach', and this would be incentivised via their performance based regulation (PBR).

Figure 2: IGov institutional framework



5.2 Distribution Service Providers (DSPs)

A new governance framework must also facilitate the creation of local markets for energy services of all kinds, and including all potential actors, for example including community groups, cooperatives, local authorities etc. as well as companies. There are various possible approaches, but one that we believe should be explored further is the transformation of distribution network operators (DNOs) into 'active' Distribution Service Providers (DSPs), sitting at the heart of the future energy system. This would reflect altering energy system economics; technological abilities; and provide a new value proposition (meaning new ways to make money doing new things) for the energy system.

DSPs effectively provide platforms for local markets and network services. They are distinct from, and go beyond, the distribution system operator (DSO) concept, in which DNOs take over some of the roles of the national system operator (e.g. related to system services such as on frequency and voltage control, possibly reactive power, reserve, handling constraint etc.) but which does not include energy services .[30] DSPs can be set up in numerous ways and a final choice still needs to be worked out. For example, the DSP can be a combined operator and wires company; it could be separate; it could be a 'platform', or a series of linked platforms. The IISO could be an institution which combines the TO and DO – a true system operator which we conceptually support.

However, the DSP concept [as a way to link system operation, customer services, local markets and achieve government energy policy goals effectively, including encouraging energy efficiency and heat policy across the system] seems to us to be potentially transformational.

The transformation of DNOs into DSPs will require change in the basis of regulation, away from anticipated demand and the asset value and towards a model where a larger proportion of their revenue is related to performance based outputs[31] and the extent to which they facilitate market transactions. This shift has started with the move from RPI-X to RIIO but does not go far enough.[32] A potential model for DSPs is the Reforming the Energy Vision initiative in New York state (NY REV).[33] This sees the move to DSPs taking about a decade, at which point they are envisaged as being the 'heart' of the electricity system with new values (or payments) available to new entrants

[30] The IGov project hosted a workshop on DSPs and the related distribution system operator (DSO) concept in May 2016. Presentations can be viewed at: http://projects.exeter.ac.uk/igov/category/events/igov-events/dsp-roundtable/

[31] See IGov blog post *Progressive regulation – what future for Ofgem?*, 26 October 2015, http://projects.exeter.ac.uk/igov/new-thinking-progressive-regulation-what-future-for-ofgem/

[32] See IGov blog post *Transformational regulation – comparing the NY REV and RIIO*, 11 August 2016, http://projects.exeter.ac.uk/igov/new-thinking-transformational-regulation-comparing-the-ny-rev-riio/

[33] See IGov blog post What, and how, the New York utilities are expected to transform to over the next decade – the New York REV's Ratemaking May 2016 Order, 13 June 2016, http://projects.exeter.ac.uk/igov/us-regulatory-reform-ny-utility-transformation/

for providing new services (both system and energy) to customers. We envisage DSPs as a means to operate the distribution area in the most energy efficient and cost effective way, including as the facilitator of market platforms, including a pool for energy and services, and as a way to complement government policies, such as renewable energy deployment and improving energy efficiency across the energy system.

Crucially, DSPs would provide a platform for 'nested' or local markets within distribution areas to enable companies, other actors and people to connect in new ways. Ultimately markets offer new ways to buy and sell energy and services within the system in a more facilitative way than is currently the case, bringing value to both the system and end users. 'Nested' or local markets within the distribution areas would give distributed energy resources (DER) the choice to either sell into the DSP pool (for either supply or demand products) or local market or directly into the national wholesale market. Customers – of different types – would also have the choice to buy and sell into any of those markets they chose to. Larger producers and customers may continue as they are buying and selling via the wholesale market. IGov would argue that new entrants, technologies, social preferences and so on are opening up new services and wishes and values in markets should be available for them.

The boundary between the IISO (discussed below) and DSP is complex. We support the principle that the system is optimised from the bottom-up via the DSPs. This is because customers and demand are inherently local, and a DSP is the way to maximise the capture of the demand side and to run a system optimally between supply and demand, including particular issues of system operation to do with time and place. In this way, the system is driven from the bottom-up. At some point, the IISO may have to intervene between the DSP and transmission to manage the system more efficiently, and its incentives need to reflect this (see below). This is an area of institutional governance which needs more discussion.

Overall, IGov argues that the transformation from distribution network operators to a DSP system seems to be a logical way to both direct the energy system to meet Government goals whilst at the same time encouraging new means of regulation and value to new markets. Market design needs to reflect this. This implies a new role for transmission, and its incentives would need to reflect this.

5.3 Independent Integrated System Operator (IISO)

Another key principle for institutional reform was the need for greater coordination in system design and delivery. Below we lay out a proposal for the design element; here we focus on delivery through an independent integrated system operator (IISO).

Because of the greater interactions in the future energy system between gas, heat and electricity (and increasingly, transport), and between the different levels of the gas and electricity networks (i.e. transmission and distribution), we propose the creation of an ***integrated*** system operator that works across all these areas. This reflects the fact that energy is a whole system: making changes in one place, will lead to changes in another part of the system and it therefore has to be integrated in order to run the system effectively.

In addition, greater co-ordination will be required between transmission and distribution, as discussed above. At the moment, the SO only really deals with transmission. We argue for a SO which takes an operator view across T and D. A SO which is linked to a TO, as is the case with National Grid, will not be trusted by the DNOs.

We accept that this is a new role for an IISO. We could understand if the DNOs were unhappy with this – were they to remain as DNOs. However, as transformed DSPs, with new regulation and incentives for a bottom-up optimised energy system with DSPs, we think this new trans-transmission and distribution IISO role makes sense.

The IISO would also be ***independent*** in that it would be separated out from the transmission operator, which would involve moving SO functions out of National Grid, where they currently sit. The IISO would take responsibility for long-term planning of networks, taking into account generation investments but also the evolution of storage and demand side response, and delivering the long-term strategy made at higher levels about the future of the gas network and heat networks. In these sense it would play the role of 'system architect' discussed by others, but with a wider framework set ultimately by the CCC's carbon budgets and the long term strategy set through a high-level energy and climate policy body (see below). Crucially, in undertaking this system operator role it would have technical capacity and expertise that currently does not exist either in Ofgem or in BEIS. The IISO would also take on the roles currently played by the SO in electricity, including half-hourly scheduling, frequency management, reserve management and ancillary services; although these would be increasingly shared with the DSPs acting at the local level (see above). The transmission operators would retain the roles of owning, building and maintaining the transmission networks, and handling connections.

Because of the conflict of interest involved in co-locating transmission network ownership and system operation in a commercial company, the difficulties in setting commercial incentives for an ISO, and because its role is closely related to the delivery of policy, the IISO would be state-owned. The IISO will ultimately have responsibility for overseeing the delivery of energy system transformation to ensure policy goals for decarbonisation and system security are met, and for the

energy system aspects of affordability. The IISO is directed by the government to ensure that it both acts to facilitate the carbon budgets set by the Committee on Climate Change.

The IISO would also house new arrangements for the governance of industry codes. Here, the key recommendation is that the current principle whereby industry itself effectively writes codes should end, and the initiative should pass to a dedicated codes management body that sits under the IISO. Codes should be changed to fit with the IISO decisions, as and when needed, although there will need to be clear and transparent links to relevant policies. To reduce complexity and duplication, code administration should come together within one body.

5.4 Data Body and Market Monitor

Open and transparent access to data, along with analysis of that data to ensure fair competition, was also identified above as key principles for a future energy governance architecture. We propose that a Data Body is created which treats data as a public good; it collects and provides access to available data within the system to ensure that the goals for energy policy are met.[34] However, the privacy of data on individuals would have to be protected under relevant legislation, with appropriate anonymization and data security provisions.

The recent CMA inquiry has highlighted the inadequacy of GB market monitoring,[35] so we also propose the creation of a new Market Monitor with oversight of all the institutions and markets in the energy system, operating independently of the economic regulator and other institutions. This body would monitor and report what is happening within markets openly and transparently. The Market Monitor and the Data Body will need to work closely together and are given remits directly from government.

5.5 Economic Regulator

IGov argues that the economic regulator should revert to its original role of being purely an economic regulator, with responsibility for regulating transmission operators and DSPs delegated from government. The wider responsibilities that it currently has in respect to social concerns and sustainability should be passed to other bodies in the system, and it should no longer be making policy decisions by default.

The economic regulator's environmental duties should effectively be passed to the state-owned IISO, which has responsibility for system security and transformation to a sustainable energy

[34] The DataHub for electricity in Denmark could provide a model for such a body.
[35] For IGov submissions to and reviews of the CMA energy investigation see http://projects.exeter.ac.uk/igov/?s=CMA+

system to meet the CCC and [what we have called] the Consensus Building Body recommendations. Because the IISO would have more technical capacity than the economic regulator, it should be more able to drive technical discussions with the TO and DSPs. We argue that the economic regulator is the wrong institution to take responsibility for social concerns (primarily affordability and fuel poverty) with respect to the energy system.

The SoS would have hierarchy over both the economic regulator, and the IISO. However, the economic regulator and the IISO are on the same level of hierarchy – this is a resetting of institutional importance from where economics / competition / the market has hierarchy to one where the latter and a strategic framework to meet the CCC recommendations are on an equal footing. This is because IGov argues that we need more strategic direction in relation to meeting Government goals. Once that strategic framework is established, then markets can work.

5.6 Consensus Building Body

Above, we argued that a new basis for long term political stability to underpin sustainable energy policy may be needed as the scale and up-front costs of transformation to a more sustainable energy and transport system increase over the next decade. This is particularly a challenge for countries like Britain where the electoral and political system does not by itself easily create consensus, and raises the question of whether a new process, outside the formal political process but connecting to political parties and ultimately feeding into government decision making, should be considered. This would be distinct from the current approach of delegation to technical committee (e.g. the Committee on Climate Change or the National Infrastructure Commission (as it is currently set up)). This is because, while it would involve the collection and analysis of technical data, it would integrate such activities together with a more political, consensus-building function.

There are few precedents for such an approach. Royal Commissions played an adjudicating role and took evidence and viewpoints from a wide range of actors, but are now defunct. In France, there were attempts to organise debates on climate policy involving a range of constituencies, although these failed largely because they did not connect with mainstream politics.[36]

We have not finally decided how institutional arrangements should be set up to meet this need – although we have called it a consensus building body. It seems to us that the basic function of the consensus building body would be to meet the current gap within GB policy-making of a way to agree a stable political consensus on how the UK can decarbonise within a long-term direction for energy and transport policy in light of carbon budgets set by the CCC. It would provide an

[36] https://en.wikipedia.org/wiki/Grenelle_Environnement

intellectual coordination of GB energy governance, including enabling a ‘national conversation’, involving all major political parties and social and economic constituencies, supported by expert input on technologies, behaviour change, costs etc. This would include gathering formal and informal feedback from all stakeholders operating with the energy system, including end users and their protection. The body would also continuously monitor and review the progress of policies in the energy, buildings and transport sectors and report these back to government, industry and wider stakeholders, thereby providing an institution which – if not holding the Government to account – highlights successes and inadequacies of governance, relative to the CCC budgets. On the basis of this process, it would make recommendations to the government of the day on long-term strategy for meeting sustainable energy policy goals.

6. Final Comments

We are aware of the pitfalls of displacing one large, inflexible and slow institution (e.g. Ofgem) with another (e.g. possibly the new IISO); or creating a number of new institutions which are unco-ordinated so that the overall impact of the changes are either no better, or slightly better or worse.

We argue that the framework streamlines the current governance arrangements to better reflect the new technological possibilities, the new energy system economics and the needs of the energy system – including meeting customer preferences and wishes, keeping costs down and meeting energy policy goals.

We maintain that whilst the GB energy system can continue without institutional change for some time, it will become increasingly costly to run the system and increasingly difficult to meet energy policy goals – including decarbonisation and security.

As said at the start, we do not see the framework proposed here as radical or costly. More, it reflects lessons learned (mostly) from energy policy practice in New York State and Denmark. In addition, it is a proposed pathway from mass subsidisation to a combination of regulatory incentives linked to outputs; strategic direction and wider market opportunities.

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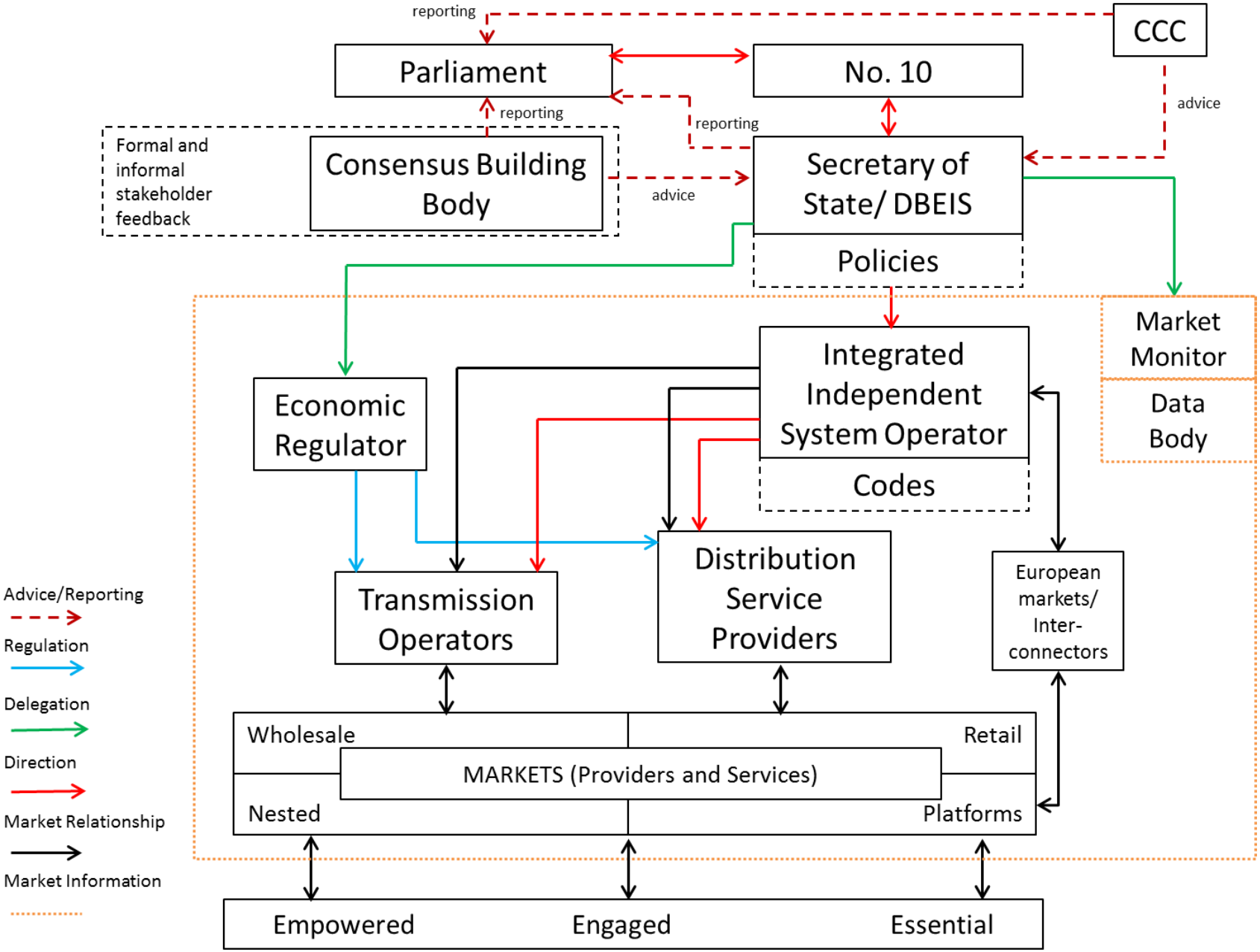
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Formal and informal stakeholder feedback
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Integrated Independent System Operator
Codes
Economic Regulator
Transmission Operators
Distribution Service Providers
European markets/ Inter-connectors
Wholesale
Retail
MARKETS (Providers and Services)
Nested
Platforms
Empowered
Engaged
Essential
Advice/Reporting
Regulation
Delegation
Direction
Market Relationship
Market Information