

Enabling the transformation of the energy system:

Recommendations from IGov

Rebecca Willis, Catherine Mitchell, Richard Hoggett, Jess Britton, Helen Poulter
IGov, University of Exeter

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1. Introduction

Over the next few decades, the UK will need to steer a major transformation of the energy system, in order to maximise the benefits of innovation, bring about rapid decarbonisation in line with the Paris Agreement on Climate Change, and ensure that the system meets all people's needs.

The current picture of governance is confused, with multiple advisory and regulatory bodies, working to different objectives, overseeing different aspects of the energy system.

Given the required scale and pace of change, there is a need for a direction-setting process, which provides co-ordination in a crowded institutional field.

This briefing is based on research conducted by the IGov project at the University of Exeter including stakeholder interviews and roundtable events, GB case studies, meetings with representatives from government, regulators and industry advisory panels, and case studies of regulatory regimes in other countries.

Our definition of governance is 'the policies, institutions, rules and incentives related to the energy system, and the underlying decision-making process which establishes those rules and incentives'.

The briefing starts by setting out the main governance and advisory bodies overseeing the GB energy system, in section 2 (different arrangements are in place in Northern Ireland). It identifies a number of problems with current arrangements: there is a lack of direction-setting and transformation management; established industry players dominate the system; there are confused signals for market participants; there is no clear responsibility for carbon reduction, demand reduction or system integration; and there are ambiguities around social outcomes.

In section 3 it then argues that the system needs to be streamlined and simplified, in order to provide stakeholders with certainty about the process of energy system transformation over time. It outlines the changes needed, including the creation of an Energy Transformation Commission (ETC) to set a strategic direction for energy governance; an Integrated Independent System Operator (IISO) to oversee the implementation of this strategy; a repurposed Ofgem leading on economic regulation; Distribution Service Providers which perform a market facilitation and coordination role; and an independent Data Body and Market Monitor.

Finally, in sections 4 and 5, the briefing offers further detail on how an Energy System Transformation Commission could be established and what its role could be.

2. Current institutional structures

The main governance and advisory bodies overseeing the GB energy system are set out in box A.

BOX A: MAIN GOVERNANCE AND ADVISORY BODIES OVERSEEING THE GB ENERGY SYSTEM

The **Department for Business, Enterprise and Industrial Strategy (BEIS)**, the government department responsible for energy and climate change, lists as one of its priorities “to ensure the UK has a reliable, low cost and clean energy system”. BEIS makes strategy and policy decisions; both the Committee on Climate Change and Ofgem (see below) are public bodies overseen by BEIS.

The role of the **Committee on Climate Change (CCC)** is “to advise the UK Government and Devolved Administrations on emissions targets and report to Parliament on progress made in reducing greenhouse gas emissions and preparing for climate change”ⁱ. The CCC is an advisory body and does not have any regulatory functions. However, the carbon targets that it advises on, set out in the 2008 Climate Change Act, are legally binding, and the CCC produces an annual progress report to Parliament. The CCC advises on measures that could be enacted to meet future carbon budgets. For example, in its 2018 report to Parliament, it suggested that new policies were required to provide a route to market for onshore wind energy, and recommended further programmes to promote household energy efficiency.

The **Office of Gas and Electricity Markets (Ofgem)** oversees the codes and the licences which all participants of the energy system have to follow, and regulates the monopoly companies that run transmission and distribution networks. Ofgem states that its “principal objective... is to protect the interests of existing and future electricity and gas consumers”ⁱⁱ. Its Duties do not include an explicit responsibility to reduce emissions in line with UK statutory targets. As part of its network regulation function, Ofgem provides incentives for innovation, such as Network Innovation Competitions (previously the Low Carbon Networks Fund). It also runs a ‘regulatory sandbox’, which “enables innovators to trial new products, services and business models without some of the usual rules applying”ⁱⁱⁱ. Ofgem also runs a number of environmental schemes on behalf of the government, such as the Renewable Heat Incentive (RHI) and the Energy Company Obligation (ECO). Ofgem is overseen by its governing body, the Gas and Electricity Markets Authority (GEMA), with a Chair appointed by government.

Private companies, regulated by Ofgem, manage the electricity and gas networks, and system operation. **Distribution Network Operators (DNOs)** manage local electricity distribution networks; a **Transmission Operator (TO, National Grid)** manage the high-voltage electricity transmission network; and **The Electricity System Operator (ESO)**, run by a separate company (which is part of the National Grid Group) oversees electricity system operation across GB. A similar structure is in place for gas transmission and distribution, except that the TO and SO still remains in one function, also owned by the National Grid Group. Although all these entities are private companies, they are regulated monopolies, with their activities, functions and price controls overseen by Ofgem, through the RII process (Revenue=Incentives+Innovation+Outputs). These companies are expected to contribute to wider energy goals, including innovation and carbon reduction, though there is no explicit requirement for carbon reduction as part of the price control process, it is a ‘reputational’ requirement.

The **EMR Delivery Body**, run by National Grid, oversees the implementation of the Capacity Market, which provides a ‘retainer’ payment for spare capacity in electricity; and Contracts for Difference, the price support system for low-carbon electricity.

The **National Infrastructure Commission (NIC)** advises on the UK’s infrastructure requirements, through publishing National Infrastructure Assessments, and monitoring government progress in delivering infrastructure, including infrastructure for generation and distribution of electricity and gas, as well as infrastructure for electric vehicles.

Energy governance is, by its very nature, complex. It needs to ensure that energy services are provided to households and businesses, securely, at reasonable cost. Achieving this requires central co-ordination, to make sure that the system operates smoothly and provides a reliable service. It also requires the regulation of businesses that are natural monopolies, such as the transmission and distribution companies for electricity and gas. There is also a need to make sure that vulnerable customers have access to energy

services; and to ensure that environmental factors are considered – particularly carbon reduction. To add a further layer of complexity, governance must be seen as a process over time, to encourage innovation, and to drive carbon reduction.

A certain level of complexity is, therefore, inevitable. However, the UK system, which has evolved since the privatisation process of the 1980s and 90s, is now exceptionally complex and difficult to navigate. Analysis by IGov has identified a number of problems with the current system, set out below.

Lack of direction-setting and transformation management: The Department for Business, Enterprise and Industrial Strategy (BEIS), as the government department responsible for energy and climate change, has overall responsibility for energy outcomes. In practice, governance is devolved to regulated bodies, particularly Ofgem. However, Ofgem’s statutory responsibilities are narrower than the overall energy system goals set by BEIS, with a primary focus on consumer protection.¹ For example, Ofgem does not have specific responsibility for encouraging innovation, and does not have a requirement to meet carbon targets, though it is specified that “reduction of greenhouse gases” should be considered within consumer interests.² In theory Ofgem should receive formal social and environmental guidance from BEIS, this process is not working.^{iv} All the other bodies listed have different, but overlapping, responsibilities and powers. The Committee on Climate Change (CCC) and National Infrastructure Commission (NIC) have a remit to plan over a long time horizon, but other bodies have shorter-term aims. It is, therefore, unclear where responsibility lies for energy system transformation over time.

Dominance of established players: The current system of energy governance favours established players, in part because of its complexity. For example, energy industry Codes and Licences define the terms under which participants can access networks and operate in markets. These Codes govern the rules of engagement in the energy system, and so are crucial in any attempt to transform the system. However, the process of drawing up and amending Codes is largely done by industry representatives, overseen by Ofgem – this is essentially self-regulation.^v In addition, established companies have greater access and resources at their disposal; given the complexity of the system and the Codes process, it is very hard for new entrants to influence decisions. There is also evidence to show that much expertise in market and governance issues lies within established companies, many of whom offer staff secondments into central government, who depend on this expertise.^{vi} All these factors skew the system in favour of established players and works against a long-term strategy of transformation.^{vii}

Confused signals for market participants: As shown in Box A, institutions with responsibility for energy governance all have different objectives and responsibilities. This increases the level of uncertainty in the system, and makes it very difficult to plan over time. For example, government strategies and statements^{viii} have set out a vision of flexible, decentralised, ICT-enabled energy system, and public funding is available for trials of this approach, through the *Prospering From The Energy Revolution* initiative^{ix} and other sources. However, Ofgem proposals, such as the recent Targeted Charging Review, work against these aims, by proposing a fixed charge to access the electricity network, regardless of the value that distributed energy resource may provide through, for example, demand response or flexibility.^x There are many such examples of confused signals.

¹ The powers and duties of GEMA / Ofgem are listed here

<https://www.ofgem.gov.uk/publications-and-updates/powers-and-duties-gema>

² <https://www.ofgem.gov.uk/publications-and-updates/powers-and-duties-gema>

No clear responsibility for carbon reduction: The UK has statutory carbon reduction targets, with rolling five-year ‘budgets’, as set out in the Climate Change Act. This process is overseen by Parliament and BEIS, taking advice from the Committee on Climate Change. However, beyond the top-level responsibility held by BEIS, it is not clear who is responsible for delivering these targets. Most organisations involved in energy governance make reference to decarbonisation, but this is not linked into the national carbon budget, and it is not clear where responsibility for achieving carbon budgets lies. For example, the Department for Transport, who are responsible for the rollout of Electric Vehicles, have presided over increases in carbon emissions from transport.^{xi} The six stated ‘strategic objectives’ of the Department for Transport make no direct reference to carbon reduction.^{xii} Similarly, the DNOs, as regulated monopolies, have no formal responsibility to reduce carbon emissions; however they manage the connection of distributed renewable electricity to the grid. The Committee on Climate Change offers advice on reduction pathways for different sectors of the economy, but individual agencies are free to take or leave this advice. There is a need for a more fine-grained process of carbon budgeting, to ensure that the most efficient and effective path to net-zero emissions is taken.

No clear responsibility for demand reduction: Neither does any organisation have responsibility for reducing overall energy demand, despite the social and environmental benefits this brings in terms of avoided costs and emissions. Modelling consistently shows that demand reduction is essential to the achievement of carbon targets^{xiii} yet demand reduction is an overlooked element of energy governance, both in the UK and elsewhere.^{xiv} Whilst BEIS have responsibility for energy supply, the determinants of energy demand are largely controlled by other government departments, including, for example, the Ministry of Housing, Communities and Local Government (MHCLG) for buildings and land use planning.

No clear responsibility for system integration: Another gap in the governance system is a co-ordination function for energy system integration. Such integration is necessary within the electricity sector – linking generation, supply, demand, flexibility services and infrastructure planning in order to bring down costs and carbon. It is also necessary to link the governance of electricity, gas, transport and other energy use. For example, the successful roll-out of electric vehicles requires alignment of transport policy with energy governance. Decarbonisation of heat also requires co-ordination, alongside important decisions on the future of natural gas networks. A whole system approach has to be taken.

Ambiguities around social outcomes: Protecting low-income households and ensuring access to affordable energy is a crucial aspect of energy policy. In the current governance arrangements, the unit cost of electricity and gas, i.e. energy bills, is widely taken as a proxy for protection of vulnerable consumers. As a result, measures which may increase unit costs are seen as problematic. This is reflected in political debates about ‘price caps’ for energy bills. There are many other ways in which vulnerable consumers can be protected, including targeted measures, company obligations, and so on. There is a legitimate question to be asked about whether support for vulnerable households should be provided through energy policy, or through wider social welfare provision. However, governance arrangements in this area are not clear. BEIS has overall responsibility, Ofgem has a responsibility for consumer protection, and Citizens’ Advice has a statutory advisory and watchdog role.

GB energy governance: current institutions and responsibilities

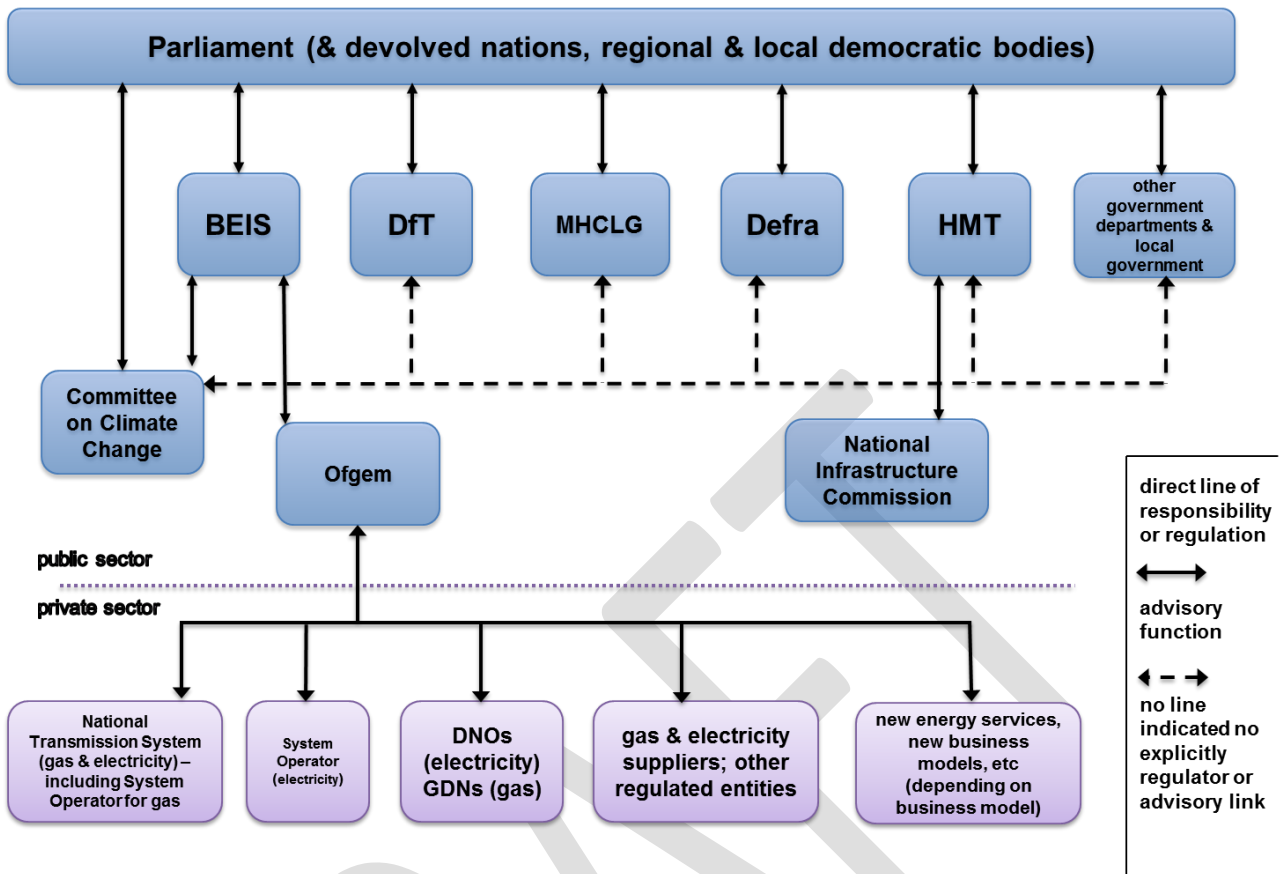


Figure 1 demonstrates the difficulties with current institutional arrangements. In particular, the chart illustrates that:

- Whilst carbon targets are economy-wide, no government departments except BEIS have a specific responsibility for carbon reduction or requirement to respond to advice from the Committee on Climate Change; neither does Ofgem have a direct relationship or responsibility in this area.
- Energy and climate governance is a process of transformation over time, yet there is no clarity over which institutions should oversee this process. Government can and should set direction, but there is a need for further co-ordination and engagement.
- There is no clear means to ensure co-ordination between institutions, to achieve vital energy system goals such as rollout of electric vehicles; social goals; demand reduction or system integration.
- Most regulation of private sector actors in the energy sector falls to Ofgem, yet Ofgem's duties do not incorporate wider energy or climate goals.
- There is no strategic oversight of the electricity and gas transmission and distribution systems.

Figure 1: GB energy governance: current institutions and responsibilities

3. Institutions for an Energy Transformation

The confused picture outlined above needs to be streamlined and simplified, in order to provide stakeholders with certainty about the aims of energy governance, and their part within it. There is a need for clear direction-setting by government, with energy governance goals co-ordinated and implemented by relevant institutions. In particular, governance should not be seen as a static function, but as a process of transformation over time.

To achieve this, IGov proposes the following changes to energy governance:

- A clear **commitment from Government** to govern and oversee a process of energy system transformation. This would, in effect, be a move from a principle of delegation to a principle of direction, acknowledging that active governance of the energy system is essential to achieving economic, social and environmental outcomes.
- Creation of an independent **Energy Transformation Commission**. This Commission would work alongside the Committee on Climate Change, Parliament and BEIS. The Commission would implement the objectives set by government. It would oversee the transformation process through co-ordinating all the institutions involved, and providing a hub for consultation and engagement. This proposal is outlined in more detail in the next section.
- An **Integrated Independent Integrated System Operator (IISO)** to oversee the implementation of this strategy, within energy markets. This non-profit organisation would integrate gas, electricity and aspects of transport, at different levels, both transmission and distribution. A key role of the IISO would be to ensure implementation of carbon goals set by the strategic level (as above).^{xv} The IISO would also be responsible for the management of industry Codes and Standards, incorporating an independent **Codes Manager** to enable open and fair consultation and engagement from all market players.^{xvi}
- **Ofgem** would retain its function as an economic regulator, regulating transmission operators and energy service providers in their delivery of what the Secretary of State had decided, and the plan the IISO had agreed.
- **Distribution Service Providers (DSPs)** would replace DNOs, to become co-ordinators of local energy systems, market facilitators and balancers. DSPs would implement the shift from the linear, top-down value chain of the energy system to one which places customers at its focus and values efficiency, flexibility and sustainability.^{xvii}
- An independent **Data Body and Market Monitor**, to oversee use of data within the industry.^{xviii}

The rest of this briefing focuses on the first of these – the creation of an independent Energy Transformation Commission (ETC). Information on the other proposals can be found on the IGov website.

BOX B: Transforming New York's electricity system – the NY REV

New York State's Reforming the Energy Vision (REV) initiative provides a good model for the process of direction-setting in the UK.^{xix}

Since 2014, NY REV has steered a process of transformation in energy governance. The catalyst for change was Hurricane Sandy, which struck the city in 2012, resulting in major disruption to electricity systems, and revealing a worrying lack of resilience.^{xx} NY Rev aims to transform the concept of an energy utility, to create a system which is focussed on customers; embraces distributed technology; reduces costs and meets city-wide carbon targets.^{xxi}

At the heart of NY Rev is the creation of new-look utility companies, called 'platform providers' or 'distributed system providers' (DSPs). These replace the traditional utility model of selling units of power from centralised generators to passive consumers. Instead of this one-directional approach, the new entities co-ordinate a two-way, or multi-way, flow between producers and consumers, incorporating balancing and response functions, to provide energy services to customers.^{xxii}

The NY Rev process both sets out a clear vision, and co-ordinates a complex process of systemic change. It starts from the understanding that the electricity system is a managed market, and that the regulatory system provides the mechanism by which incentives for utilities are aligned with the aims of the system as a whole. There is high-level political support from the Governor of New York State, and the process itself is delegated and managed through an independent Board.^{xxiii} In this way, it is an example of a new balance between regulation and markets, where there is more direction from the legitimate, policy maker. This reflects a difference from the GB principle of delegation.

Since 2014, the Board has overseen a complex process of regulatory change, in order to redesign the market to achieve the aims of NY REV. There are more than forty work streams, each with stakeholder involvement, examining in detail issues such as customer engagement, customer protection, models of metering, and so on. These work streams are all linked into a wider vision of system change. Conscious efforts are made to resist inertia, through maintaining a focus on the transition process.^{xxiv}

Through NY REV, New York State has managed to avoid many of the difficulties that beset the UK system, as the table below shows.

Difficulty in UK system	NY REV solution
Lack of direction-setting and transformation management	NY REV process set clear goals, agreed by Governor but the process of achieving them is delegated to the Board
Dominance of established players	Through goal-setting and working group structure, efforts made to resist inertia, hear from wide range of stakeholders
Confused signals for market participants	Vision linked to clear goals & open process
No clear responsibility for carbon reduction	Agreed goal of CO2 reduction for NY state – 40% reduction by 2030; 80% by 2050. Covers power generation, industry, buildings & transportation
No clear responsibility for demand reduction	DSPs are incentivised to manage demand efficiently
No clear responsibility for system integration	System integration process is overseen by NY REV; DSP model provides system integration for customers
Ambiguities around social outcomes	Customers at centre of DSP business model

4. Establishing an Energy System Transformation Commission (ETC)

The ETC would oversee a direction-setting process, co-ordinating the key actors across the energy governance domain, and involving other actors as necessary. The ETC would not manage day-to-day regulatory issues; its function would be advisory, but it would set the overall direction within which other actors operate.

IGov's vision for the ETC is informed by experience from elsewhere. The New York REV process, outlined in Box B above, is the most similar to our proposals. Lessons can also be learned from the Danish system of negotiated Energy Agreements, which are agreed between the major political parties and supported by the Danish Energy Agency.^{xxv}

The purpose of the ETC is not to replace elected politicians. Government and parliament would continue to set high-level goals, agreeing trajectories for carbon reduction under the carbon budget framework; social goals; and other aims such as industrial strategy and innovation. The ETC would work with stakeholders, as described below, to oversee the implementation of these goals. As such, it would provide the link between political direction-setting and day-to-day governance. By setting a direction and providing clear market signals, the ETC would enable competition and innovation in the energy sector. In short, there would be a new relationship between markets and regulation.

The guiding principles of an ETC would be to:

Transform: The ETC oversees a process of change over time – a transformation of the energy system. Its role is not to oversee a static market. The goals would be set through a negotiated process, overseen by government; the aims would be to decarbonise, to allow innovation, to reinvigorate competition, to develop efficient and effective energy services, and to protect vulnerable groups, including getting rid of fuel poverty as a major issue within the GB by agreeing a process for energy justice within the energy transformation.

Co-ordinate: The ETC would be the main focus of co-ordination between different energy actors, including governance and advisory bodies, private companies and other stakeholders. It would bring different groups together, depending on the issue; for example, on electric vehicles it would bring together BEIS, the Department for Transport, the NIC, companies involved in the sector, network operators and so on. This is described in more detail below.

Engage: The ETC would engage a wider constituency in energy governance issues. This would include a stakeholder engagement process – eg businesses not directly involved in the energy industry; business associations; trade unions; consumer, environmental and other interest groups; etc. It would also include public engagement, to gather intelligence on public views and values on the transformation process.

How would the ETC work?

The ETC would be established as a public body, through primary legislation. It would provide the co-ordination and engagement that is required to deliver long-term aims set by the democratic process, including goals for decarbonisation, social goals and other energy system requirements. In doing so, it would take advice from the Committee on Climate Change and the National Infrastructure Commission, and also provide an advisory function

for government. All government departments, not just BEIS, would be required to work with the ETC in order to further goals set through the democratic process.

Figure 2 sets out the position of the ETC in the energy governance landscape.

The ETC's core function would be to provide strategic oversight of progress toward energy system goals, as set by government. It would also act as a hub for engagement, both for industry stakeholders and the wider public. Whilst keeping a focus on the overall process of transformation, the ETC would also work on a project basis to build consensus and co-ordinate planning in key areas of change, such as the roll-out of electric vehicles.

The ETC's work would focus on direction-setting, co-ordination and engagement; it would not be a delivery body. Ofgem, repurposed as an economic regulator, and an independent, integrated System Operator would deliver the required regulatory and system operator functions, in line with overall goals set by government and co-ordinated by the ETC.

The specific functions of the ETC are outlined below.

The strategic oversight function: The ETC would map progress toward energy system goals, as set by government, including decarbonisation, innovation and social goals. Through a process of consultation and consensus-building, it would assign responsibilities and agree the contributions to be made by different regulatory bodies. This would be achieved through an annual summit, convened by the ETC, bringing together the Secretary of State for BEIS, and the Chairs and Chief Executives of energy system regulators and advisers, to monitor progress toward energy system transformation. Through this process, the ETC would take direction from government, and would also offer advice back to government, based on its work.

An engagement function: Stakeholder engagement would be designed to encourage input from new entrants as well as established industry players. Alongside this, the ETC would also collect and incorporate wider public views into account, through incorporating existing consumer research, polling and deliberative processes, and commissioning new work where necessary. It would also keep track of technology change, costs, new business models and new regulatory compacts occurring around the world.

The deep-dive function: The ETC would work on a project basis to oversee particular elements of energy system co-ordination and transformation, which require consensus-building and forward planning. Areas that could require such input include:

- The implementation of a country-wide buildings energy efficiency improvement programme
- Develop a process which addresses distributional impacts of transformation policies
- The transition to electric vehicles
- Decarbonisation of heat, including the future of the gas grid
- Developing domestic demand response and flexibility services
- The development of local energy markets.

For each of these areas, the ETC would bring together representatives from the relevant government departments, regulatory bodies, established businesses, new entrants and other stakeholders, to co-ordinate the transformation process.

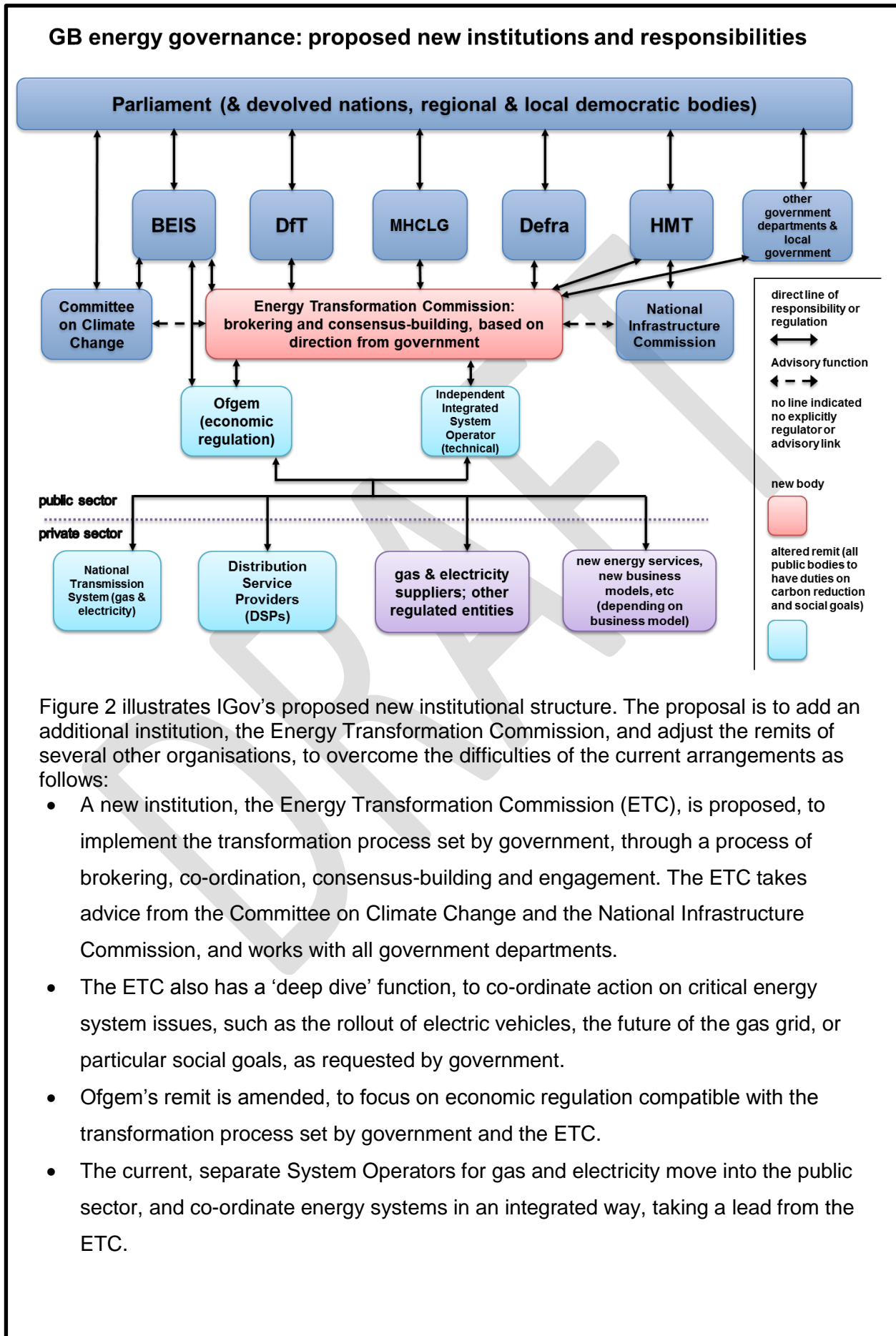


Figure 2 illustrates IGov's proposed new institutional structure. The proposal is to add an additional institution, the Energy Transformation Commission, and adjust the remits of several other organisations, to overcome the difficulties of the current arrangements as follows:

- A new institution, the Energy Transformation Commission (ETC), is proposed, to implement the transformation process set by government, through a process of brokering, co-ordination, consensus-building and engagement. The ETC takes advice from the Committee on Climate Change and the National Infrastructure Commission, and works with all government departments.
- The ETC also has a 'deep dive' function, to co-ordinate action on critical energy system issues, such as the rollout of electric vehicles, the future of the gas grid, or particular social goals, as requested by government.
- Ofgem's remit is amended, to focus on economic regulation compatible with the transformation process set by government and the ETC.
- The current, separate System Operators for gas and electricity move into the public sector, and co-ordinate energy systems in an integrated way, taking a lead from the ETC.

- DNOs become Distribution Service Providers, co-ordinators of local energy systems, market facilitators and balancers.

Figure 2: GB energy governance: proposed new institutions and responsibilities

5. Making it happen: Starting the reform process

As described above, the ETC would be one element in a reformed energy governance landscape. IGov's suggested approach is to start the reform process through the creation of the ETC. The first task of the ETC would then be to review existing organisations and responsibilities, and make recommendations to government for the reorganisation and streamlining of these organisations and their functions. While this process was happening, the ETC could begin its core work.

The system proposed by IGov does imply a greater level of steering and direction-setting in energy systems than the current model – IGov analysis shows that such direction-setting is needed. However, it would also involve a streamlining of governance and advisory organisations, so would not necessarily result in greater bureaucracy or expenditure. It would reduce or eliminate the need for individual taskforces, commissions or inquiries, such as the EV Energy Taskforce or National Grid's Future of Gas Project. If these consultation/inquiry processes were all coordinated or overseen by the ETC, that would allow greater clarity and transparency for stakeholders, and a more standardised approach to consultation and engagement, ensuring that new entrants as well as established companies can participate in the process, and that all such processes are clearly linked to system transformation.

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- ⁱ <https://www.theccc.org.uk/about/>
- ⁱⁱ <https://www.ofgem.gov.uk/about-us/who-we-are>
- ⁱⁱⁱ https://www.ofgem.gov.uk/system/files/docs/2019/02/enabling_trials_through_the_regulatory_san_dbox.pdf
- ^{iv} <http://projects.exeter.ac.uk/igov/new-thinking-the-lost-strategy-and-policy-statement/>
- ^v <http://projects.exeter.ac.uk/igov/wp-content/uploads/2015/12/ML-Innovation-energy-industry-codes-in-GB1.pdf>
- ^{vi} Historical institutionalism and the politics of sustainable energy transitions: A research agenda Matthew Lockwood, Caroline Kuzemko, Catherine Mitchell and Richard Hoggett xx ref xx; Kuzemko, C. (2016). Energy Depoliticisation in the UK: Destroying Political Capacity. *The British Journal of Politics and International Relations*, 18(1), 107–124. <https://doi.org/10.1111/1467-856X.12068>
- ^{vii} <http://projects.exeter.ac.uk/igov/wp-content/uploads/2015/12/ML-Innovation-energy-industry-codes-in-GB1.pdf>
- ^{viii} <https://www.gov.uk/government/speeches/after-the-trilemma-4-principles-for-the-power-sector>; see also the Clean Growth Strategy & The Industrial Strategy
- ^{ix} <https://www.gov.uk/government/news/prospering-from-the-energy-revolution-full-programme-details>
- ^x <http://projects.exeter.ac.uk/igov/wp-content/uploads/2019/02/Exeter-EPG-response-to-Ofgem-Targeted-Charging-Review-Feb-2019.pdf>
- ^{xi} <https://www.theccc.org.uk/wp-content/uploads/2018/10/Lord-Deben-to-Chris-Grayling-Greg-Clark-on-Road-to-Zero.pdf>
- ^{xii} <https://www.gov.uk/government/publications/department-for-transport-single-departmental-plan/department-for-transport-single-departmental-plan-may-2018>
- ^{xiii} <http://projects.exeter.ac.uk/igov/wp-content/uploads/2014/02/WP-6-Demand-and-Decarbonisation-in-2050.pdf>
- ^{xiv} For a discussion of this point, see, for example, Jan Rosenow, Nick Eyre and Darren Croft, Energy Policy in Transition: Evidence from energy supply and demand in the UK, ECEE Summer Study Proceedings, January 2013
- ^{xv} For more detail, see <http://projects.exeter.ac.uk/igov/wp-content/uploads/2017/03/Ofgem-Future-arrangements-for-the-electricity-SO-submission-from-EPG-March-2017-FINAL.pdf> and <http://projects.exeter.ac.uk/igov/new-thinking-not-just-independent-but-also-integrated/>
- ^{xvi} <http://projects.exeter.ac.uk/igov/wp-content/uploads/2016/09/Lockwood-et-al-Innovation-and-the-governance-of-energy-industry-codes.pdf>
- ^{xvii} <http://projects.exeter.ac.uk/igov/blog-1-of-name-form-and-function-of-distribution-entities/>
- ^{xviii} <http://projects.exeter.ac.uk/igov/5001-2/>
- ^{xix} <http://projects.exeter.ac.uk/igov/comparing-ny-with-ca-blog-2-catching-up-with-the-ny-rev/>
- ^{xx} Scott Weiner presentation to IGov Direction-Setting event
- ^{xxi} Scott Weiner presentation to IGov Direction-Setting event
- ^{xxii} see this blog for a detailed discussion of ‘platform providers, also known as ‘distributed system providers’ or ‘distribution service providers’
<http://projects.exeter.ac.uk/igov/comparing-nys-with-ca-blog-6-dso-or-dsp-why-it-is-the-function-rather-than-the-name-that-really-matters/>
- ^{xxiii} <https://energyplan.ny.gov/The-Board/Board-Members>
- ^{xxiv} Scott Weiner presentation to IGov Direction-Setting event
- ^{xxv} <https://stateofgreen.com/en/profiles/state-of-green/news/the-energy-commission-presents-recommendations-for-denmark-s-future-energy-policy>