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Electricity Market Reform: So what's new?

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Abstract:	The British government has restructured Britain's electricity markets through a programme of Electricity Market Reform (EMR). Energy security and climate change mitigation are public goods that are prioritised. Cultural theory (CT) is used to explain changes in the regulatory regime under EMR. EMR involves an incomplete shift from 'individualist' to 'hierarchical' frames of regulation. Conflicts between these frames hamper the institutional design of EMR. This has obstructed deployment of nuclear power. Policymakers must fit the cultural framing to suit their preferred public good and not expect a defined public good to emerge from a preferred mix of cultural bias.
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Electricity Market Reform: So what's new?

Introduction

Throughout the 1980s and the 1990s, successive British governments privatised state owned utilities and public services. Public goods would be delivered through commercial markets and government would steer at arms length. However, the British government has recently shifted towards an interventionist stance. This paper uses cultural theory (CT) to examine this shift.

In 2013, the British government restructured Britain's electricity markets through a programme of Electricity Market Reform (EMR). Energy security and reducing carbon emissions (through transition to an electricity system based around low carbon technologies) can be understood as public goods (Abbott, 2001). EMR aimed to create regulatory mechanisms that would encourage investment in nuclear power, renewable energy, and Carbon Capture and Storage (CCS). A new system of contracts, called 'contracts for differences' (CfDs) was introduced to give guaranteed, indexed linked, prices for electricity generated from low carbon sources over specified long term periods. EMR also proposed a 'capacity mechanism' designed to ensure that there is sufficient generating capacity to meet peak demand for electricity. These measures operate alongside a policy of increasing the price of fossil fuels through the use of a 'carbon levy'. This levy takes the form of a carbon floor price that seeks to boost the low EU ETS price, although in 2014, the government decided to cap such increases.

Kern et al. (2013) suggest that since 2003 there has been a 'paradigm' shift in the British electricity industry. The focus on using the market to realise policy has been replaced by an approach that allows for greater state steering. Government involvement is now thought

necessary to promote investment in the infrastructure necessary to secure the public goods of energy security and a decarbonised economy (Bolton and Foxon, 2015). However, as Kern et al. (2013, p. 1) point out*'…there has been relatively little shift in how energy systems operate…'*As they imply, sociotechnical theories may be more efficacious in studying changes in technical systems compared to political science.

Nevertheless changes introduced through EMR constitute political regulation, and the success of this qualitatively different system depends on regulatory effectiveness. Government now makes technological choices, makes orders for reserve generation and negotiates details of some individual projects. However, Kern et al (2013) do not describe EMR in detail whilst Bolton and Foxon (2015) do not discuss the logic informing the regulatory changes instituted by EMR. The public goods associated with EMR (energy security and decarbonisation) are difficult to realise due to the sheer costs involved in constructing electricity generation infrastructure. However, as electricity is critical for operation of modern society and climate change may pose a catastrophic threat, the British government cannot avoid its responsibilities. Indeed, Giddens (2015: 157) observes that to address climate change, governments must act to curtail carbon emissions. Likewise Johnston and Deeming (2015) also stress the need for government intervention. As such, EMR represents a special case of regulatory reform and understanding the factors that inform government decisions is key task for public policy scholars.

This paper develops analysis of the design of EMR itself. The central research question is to understand how, and the extent to which, the electricity system has moved from an emphasis on outcomes being decided by market mechanisms towards outcomes being influenced by state direction. We develop cultural theory's application in public policy, in the fields of public regulation and public goods. We use CT to understand and explain change in public regulation, how public goods are constructed and how government attempts to realise them through that regulation (in EMR). As we discuss in the next section, CT is well

placed to study the process of constructing and implementing public goods, regulatory and institutional change and the tensions between different cultural biases. In this case, a tension can be observed betweenenhanced state interventions through EMR in an era of economic liberalisation. The lessons could throw light in other cases involving conflicts of political economy and the delivery of public goods. This CT analysis may highlight a particular problem in regulation of public goods policies when there are conflicts between different cultural preferences. Cultural theory may prove applicable to many other areas of regulation of public goods, although further studies will be needed to determine how wide this scope could be.

Cultural Approaches to Regulation

Cultural theory (CT) is an approach that was developed through the work of Douglas (1974, 1982), Douglas and Wildavsky (1982) and others (see Thompson et al. 1990 or Mamadouh1999 for reviews) and has been successfully applied to public administration and regulatory issues (Hood 1998, Lodge et al. 2011). CT argues that social behaviours reflect inherent cultural bias and claims that there are two basic divisions, or dimensions within a culture: attitudes around 'grid' and 'group'. Grid concerns (positive or negative) attitude to rules whilst group concerns attitude to group solidarity, either weak or strong. Put together these dimensions generate four basic cultural approaches, seen in the Figure 1.

Figure 1 here (see m/s end)

First, (top left) is a pattern of apathetic rule-following and 'fatalist' political disengagement. Bottom left is individualism, associated with choice, competition between people and – by extension - use of markets to allocate resources. In contrast, 'egalitarians' have higher group and favour behaviour based on solidarity with particular norms or values rather than

rules per se. Finally, top right 'hierarchists' favour an ordered society based on both group coherence and rule following. In his application to regulatory systems, Hood (1998, 100) argues that the 'individualist' (non-group, non-rule oriented) approach assumes that

"…markets will ordinarily produce better results than bureaucratic hierarchies…"

Cultural theory can complement institutional analysis in the renewable and low carbon energy sphere (Kern et al. 2014, Lauber and Schenner 2011) by helping to understand how institutional change occurs. Cultural theorists argue that the design of institutional arrangements reflects the cultural bias of a society; something that can be identified through CT. Swedlow (2011, 704) says:

> *CT contributes significantly to institutional accounts of politics by specifying the types of institutions that can exist...Events and behavior that are anomalous from one cultural perspective, and/or better explained or understood from another, can be catalysts of cultural change for both individuals and institutions*

A key advantage of the CT approach compared to other modes of ideational analysis is that it can categorise types of cultural bias and link them to how different institutions and public policies emerge and change. Institutions and policies may differ as they embody some types and/or combinations of cultural bias rather than others.

The construction of demand for public goods and the shift towards more interventionist methods in an area of public regulation can be understood by reference to changes in grid and group orientations. It is possible to use CT to understand how greater priority given to public goods such as carbon reduction and energy security is associated with the regulatory changes deployed to accommodate them. In particular, carbon reduction and energy security are collective problems (associated with high group) but given the scale of the investments needed, strong rules are necessary to govern the market to ensure that companies are incentivised to make the necessary investments (requiring high grid). Liberalised markets do have rules, but these are to assist competition (low grid) as companies vie for business against others (low group).

Measuring Cultural Bias

This can be done through using surveys directly, using evidence from surveys to link particular policies and cultural bias, and by making judgements about how specific policies can be associated with particular cultural biases. We do not survey individuals for this study because we seek to link cultural bias with changing policies and regulations in EMR rather than attitudes of policymakers themselves. However, we do make use of existing surveys to link cultural biases and political strategies (e.g. between notions of 'order' and 'hierarchy'), and also to analyse how cultural bias may influence policy outcomes.

Several CT analyses have measured cultural bias by using judgement to associate particular attitudes and/or policies and institutions with different cultural biases. These include Hood (1998), Hendriks (2004),and Tansey and O'Riordan (1999), the latter two examining issues with a strong environmental component. We adopt this technique of measuring cultural bias; we make judgements about whether policies reflect individualism and competition (low grid and group), hierarchy (high grid, high group) or egalitarianism (low grid, high group).

Wildavsky (1987) discusses poll findings that reveals differences in preferences for public goods such as defence between 'the general public', 'executives of small and large corporations' and, 'environmentalists', commenting that: *'Maintaining order in the nation gets around 80% or more from everyone else but just 47% from environmentalists. On an egalitarian issue, such as having more say at work, the situation is reversed'* (Wildavsky 1987, 14). These are US studies, but they may cast light on linkages in British politics. Gamble (1988) characterised Thatcherism as 'the free market and the strong state'. This involves a conservative attachment to competitive individualism in the economic sphere but also an attachment to maintaining social order, or hierarchy, for example through the police.

Jones (2011) studied attitudes to climate change. He found that both egalitarian and hierarchical viewpoints gave priority to climate change as a policy objective. The egalitarians were environmentalist in standpoint whilst the hierarchs followed scientific opinion. Individualists were less interested in climate change as a leading policy objective. Johnston and Deeming (2015) also point to importance of examining underlying values and cultural beliefs and highlight attitudinal distinctionson the subject of climate change between individualists and hierarchs. We can utilise these findings in this study. For example, a hierarchical preference for 'order' could be associated with assuring energy security, and this could in turn be associated with promoting certain technologies such as nuclear power. Particular instruments, e.g. auctions, may be associated with an individualist approach whilst egalitarian' environmental groups often espouse renewable energy.

Many consumers are unconcerned about policy issues and can be described as policy 'fatalists'. However we do not focus on 'fatalism' as a cultural bias in this study. Many applications of CT dispense with the 'fatalist' as fatalists have disengaged with political processes (see Swedlow, 2011, 707). We also dispense with this category as it does not help analyse institutional change in this case.

Regulation and public goods

Public goods are, according to Hood (1983, 4) concerned with a) the jointness of consumption; consumers cannot derive solutions 'separately and severally', b) 'non-excludability'; it is not possible to stop those who do not wish to pay for the public good from consuming the benefits, and c) 'Indivisibility'; the provision of the public good for one consumer does not reduce the 'benefits conveyed to others by these works'. We categorise three streams of theory of public goods. One stream focuses on problems of implementation (Ostrom 1991, Rhinard et al. 2013). A second stream, a 'public choice' approach, asks whether public goods are artefacts of governments who manufacture

activity at the behest of well-placed interest groups (Holcombe 1997). A third stream examines how the 'public good' is constructed through the growth and activity of social movements (Williams 1995). Public choice approaches reflect an 'individualistic' bias, given their prioritisation of market rather than state based activity to solve problems, whilst social movement approaches represent an egalitarian bias since they focus on how social movements, which tend to pursue egalitarian objectives, construct some public goods. We combine lessons from these different streams to analyse how cultural bias influences the construction of public goods in the electricity sphere.

Public goods associated with energy policy, namely the reduction of carbon emissions and stability of supply (energy security), share key characteristics with welfare goods such as education, social security and health. Decisions regarding the means of supply and the distribution of such goods have to be interpreted and are contested. Energy security is capable of various interpretations (Toke and Vezirgiannidou 2013) and there are several combinations of technologies that can achieve low carbon outcomes. The politics of energy are ensconced in regulatory processes, which are themselves influenced by changing political economy, in particular the balance between state direction and market power.

In the late 1980s, there was a move away from hierarchical modes of governance in the public sector. Industries and public utilities were privatised and liberalised. An individualistic cultural bias displaced hierarchical means of governance. Governments sought to govern markets at a distance through arms length oversight and use of rules and standards (Yeung 2010, p. 65-67). Majone (1994) described the emergence of a 'regulatory state' in place of the publically owned and managed 'welfare state'. Underpinning the regulatory state was an individualist worldview that held that the role of modern government was to ensure the functioning of markets, achieving low prices for consumers. Governments did not issue instructions to industry about particular projects but sought to steer through regulation.

However, under EMR there is a greater degree of steering by the state than was in evidence before.

Method

Our method mobilises themes of cultural bias to analyse EMR. This is a generalised type of 'thematic' study (Braun and Clarke 2006). Our study, whilst generalised in the sense that it does not engage in a specific coding methodology, nevertheless utilises various sources of text to chart changes in the construction of public goods and regulatory policy using CT. Although EMR itself only began towards the end of 2010 it is necessary to analyse the emergence of public goods before 2010 as well as their significance afterwards. However the most intense period of analysis is since 2010.

The data that we use includes interviews from a funded study of nuclear power policy and also one interview designed to investigate the role of the Committee on Climate Change. The interviews were held with both governmental and non-governmental policymakers. We used this data as evidence alongside documents including governmental policy position papers, governmental policy notes, papers and statements by a range of commercial and non-commercial NGOs and media reports carried in the popular and energy industry trade press.

By triangulating our data, we are able to judge which documents and public statements reflect important decision-making, after which we can identify the key passages and then associate them with the CT analytical framework that we have set out. The first empirical section deals with how cultural bias can be used to frame energy security and climate change as public goods in the electricity sector, so setting the scene for the adoption of EMR. There is a historical theme to this since there is a drift from 'individualistic' towards more 'egalitarian' and 'hierarchical' orientation of public goods. The second, most

extensive, empirical section will detail how, based on this construction of public goods, cultural bias is associated with aspects of the electricity regulatory framework ensconced in EMR. We again divide the discussion up, again, into 'individualism', 'egalitarianism' and 'hierarchy'. In practice, the policy instruments will often be influenced by more than one cultural bias, so it is not always possible to hermetically seal each section from the others.

The construction of public goods

We focus on the construction of two public goods in particular, carbon emission abatement and energy security.

Individualism: The electricity industry was privatised and liberalised in 1990. The dominant frame was one of individualistic competition in which the [regulatory] state was restricted to achieving 'market efficiency' (Majone 1994).The public good was to be achieved through competition between providers, with the aim of reducing prices for consumer. There were some marginal exceptions to this lack of direct government involvement in generation investment decisions. The Government withheld nuclear power from the privatisation effort and established a 'fossil fuel levy' (effectively a production tax) to fund a 'non-fossil fuel obligation' (NFFO) to assure the completion of the half-built Sizewell B nuclear power plant (Bier et al. 2003, 122). In addition, a nascent renewable sector was encouraged as contracts were reserved for renewable energy projects. However, this renewable programme was small, limited to around 1 per cent of electricity generation (Mitchell and Connor 2004).

Energy security was associated with 'diversity' of supply and little attention was paid the need to reduce greenhouse gases. This approach was reflected in the Government's 1995 review of nuclear power (DTI 1995) which held that there were "…no compelling reasons for supposing that the market will not of its own accord provide an appropriate level of diversity' (DTI 1995, 38). State support of nuclear power was not necessary and Britain's most modern nuclear power plants should be privatised. It was assumed that the private

sector would invest in nuclear power should it prove economical. The review also argued that there was 'uncertainty' about the extent of need for future reductions of carbon dioxide emissions and that new gas fired power plants being built would obviate the need for new nuclear power (DTI 1995, 26-30). The scepticism about prioritising carbon reduction, the strong support for markets and the disavowal of state steering are consistent with individualism.

Egalitarianism: Conflicts began to emerge between the aims of market efficiency and emergent demands for non-market objectives, particularly for sustainable energy (Mitchell and Woodman 2010, 573-576). The Utilities Act of 2000, introduced by the Labour Government, amalgamated the regulators for gas and electricity, producing OFGEM. According to Moran (2003, 111) the legislation *'imposes on OFGEM an obligation to have regard in regulation to various socially excluded groups, and to take guidance from the Secretary of State on social and environmental objectives.'* These are egalitarian objectives, albeit delivered in the context of competitive markets. In 2002, a Renewables Obligation (RO) was introduced to increase the proportion of electricity supplied by renewable energy. However, nuclear power was still excluded from access to incentives on the grounds of a lack of economic viability (DTI 2003).

The Renewables Obligation (RO) was a 'market based' scheme managed by OFGEM where government did not 'pick winners' and, initially, offered the same incentives for all renewable energy technologies (DTI 2000). Decisions about contracts and prices were made by the electricity industry themselves and it was hoped that this would generate lower prices through competition between market actors. Hence the 'egalitarian' objectives that were introduced were combined with a dominant 'individualist' cultural bias that ordained market mechanisms as the desired mode of operation. As the decade progressed there was an intensification of commitments regarding climate change, leading to the 2008

Climate Change Act, which committed the Government to delivering an 80% reduction in greenhouse gas emissions by 2050.

Hierarchy: From 2004 onwards, energy prices began to rise sharply alongside oil price increases. Contemporaneous to this, imports of natural gas rose as consumption increased and North Sea production fell. These events were associated with rising fears about energy security. According to Kuzemko (2014) energy policy objectives became more politicised and 'securitised'. Fears about maintaining order in the sense of maintaining both the reliability and the political security of the energy supply grew, leading to demands that the state take action to maintain this order. Government policy shifted towards seeing nuclear power as crucial to maintaining energy security (alongside climate change mitigation) and that 'the Government should take active steps to facilitate this' (DBERR 2008, 6).

Also concerns mounted that the RO was not cost-effective and that it was too oriented towards onshore rather than offshore wind. Hence there was a move towards greater hierarchical determination of what prices should be paid for different types of renewable energy technology, with the quantity of incentives given under the RO modulated according to different renewable energy technologies. OFGEM organised an initiative called 'Project Discovery' which reported in February 2010 and favoured a direct role for government in ensuring the construction of new electricity generation capacity (OFGEM 2010). This was followed by similar calls by an inter-departmental report(Treasury/DECC 2010, 4-5).

The Committee on Climate Change (CCC), established following the passage of the 2008 Climate Change Act, recommended the use of nuclear power, renewable energy, energy efficiency, and CCS to achieve the Act's goals. The CCC became, in formal terms, an arbiter of knowledge about government policy. For example, the coalition agreement between the Conservatives and Liberal Democratsstates that decisions regarding expansion of renewables will be made be "…subject…"to the advice of the CCC" (HM

Government, 2010, 16). Likewise, the CCC was asked, in 2011, to 'arbitrate' between the coalition partners who differed on the relative roles of nuclear power and renewable energy (interview with official of CCC 16/12/2013). Knowledge about counteracting climate change was thus dispensed in a hierarchical fashion through the CCC.

Cultural bias and different public goods

It should be borne in mind that as public goods energy security and climate change may appeal to different political currents of opinion and that the differences can be understood using the cultural bias categories. As discussed earlier, in reference to work by Wildavsky (1987), the hierarchical notion of 'order' and energy security is likely to appeal to conservatives and establishment actors rather more than egalitarian environmental interests. On the other hand, environmental objectives, including climate change are likely to appeal more to environmentalists than notions of order and energy security. Opinion polling conducted by YouGov in 2013 (YouGov 2013a and 2013b) implies sets of opinions that may correspond to such analysis.

A large majority of Conservative voters agreed that 'it was right to spend money supporting nuclear power' (60 to 21 per cent), while a majority of Labour voters were against this proposition (40 to 31 per cent) (YouGov 2013a 8). Labour voters tended to be more favourably disposed towards renewable energy than Conservatives. On the other hand, a clear majority of Conservative voters agreed with the statement that climate change claims 'Have been exaggerated - the threat is not as real as many scientists have said' (by 54 to 35 per cent), whilst a large majority of Labour votes agreed that the claims have NOT been exaggerated (by 64 to 20 per cent) (YouGov 2013b, 14). Conservative voters may be attracted to the notion of order and security, even though they may not be so enamoured by the need for strong action to counter climate change as Labour supporters. Environmental NGOs have been enthusiastic about promoting renewable energy, but indifferent or actively

hostile to nuclear power. Support for measures to ensure construction of new nuclear power has been strongest among establishment lobbyists such as the major electricity companies. These companies took increasing interest in nuclear power and formulated proposals for up to 10 new nuclear power stations post 2007 (Jones 2009).

We can see that the public goods that are the key basis for EMR, carbon reduction and energy security, appealed to different constituencies of voters on the basis of differing cultural biases. Conservatives may value nuclear power more because it can produce 'order' through energy security and is highly centralised, while green activists may prioritise combating climate change and value renewable energy, which is more decentralised.

Details of Electricity Market Reform (EMR)

The changing understanding of public goods has informed a gradual shift towards more hierarchical approaches to regulating the electricity market, and this can be better understood in the context of how this co-exists with other types of cultural bias. We now discuss how different cultural biases have informed EMR.

Individualism: Advancing carbon reduction and energy security was underpinned by a commitment to markets and competition. EMR would 'lead to competition within and between different low-carbon generation technologies for their appropriate role in the energy mix'. The electricity market was to be reformed to produce more competition between generation technologies and companies, greater access for new market entrants and increased market liquidity (DECC 2012, 8).The Government emphasised that it was offering support for *all* low carbon technologies (DECC 2012). In respect of plans for new nuclear builds, the Secretary of State for Energy and Climate Change insisted that: 'I am determined that the consumer or the taxpayer will not bear the risk of construction over-runs' (Wintour 2013). Auctions were to be the preferred method of delivering premium price

contracts for difference (CfDs) to ensure competitive outcomes for low carbon energy The contracts for difference were made available for non renewable, low carbon energy sources including carbon capture and storage and nuclear power.

The Government's initial proposals for EMR (DECC 2010) appeared to favour having an auction that would result in the same prices being offered to all low carbon generators. However, this proposal was criticised on account that it seemed to offer a 'one size fits all' solution in that one type of contract would be available for all generators. The Select Committee on Energy and Climate Change argued that this would benefit nuclear power developers but penalise renewable generators. It seemed to many (at that time) that nuclear power would be the cheapest main source of low carbon energy (Committee on Climate Change 2011) and other technologies would have to compete against the price set by nuclear power. Government was inching towards a more hierarchical role in deciding a premium price payable for low carbon electricity, but still held out an expectation that markets could decide what the relative mix of technologies necessary to secure low carbon electricity generation.

A White Paper on EMR followed in the summer of 2011 and proposed that a set of differentiated prices should be paid for low carbon electricity sources – various types of renewable energy, CCS, and nuclear power. These would be premium price agreements realised through 'contracts for difference.' However, the White Paper failed to make clear who would 'guarantee' that the prices would be paid. The Treasury expected the guarantee to be borne by the network of private electricity company actors through a levy and settlement mechanism. This was regarded as inadequate by both nuclear developers and renewable energy developers. Industry wanted the government to act as a 'counterparty' to the CfDs to guarantee that the premium prices would be paid according to the CfD terms. Failure to achieve this would increase the financial risks in low carbon energy. As we discuss below, the Government later agreed to guarantee the CfDs in what was a shift towards hierarchy.

In the end the Government did organise a competitive method of allocating CfDs through a process involving 'auctions' of CfDs, although only for renewable energy. The results presaged what was acclaimed as a sharp reduction in premiums necessary to support renewable energy projects. (Carbon Brief 2015). However no auctions for other technologies appeared on the agenda.

Egalitarianism: Egalitarianism formed the centrepiece of the justification for the policy of giving premium price CfDs to 'low carbon fuels.' First it offered equality of support to companies on the basis of whether they could achieve an environmental objective, and secondly it represented a key policy driver for the achievement of climate change objectives themselves. However, this approach was widely seen as a heavily disguised way of providing subsidies to nuclear power given previous commitments (Select Committee on Energy and Climate Change 2011). The 'egalitarian' support for renewable energy by way of its promotion in support of climate change abatement pre-dated EMR, in the form of the Renewables Obligation (RO). In addition, a feed-in tariff for small renewable energy projects had been put in place under legislation passed in 2008.

A further low carbon technology, carbon-capture and storage (CCS), was made a candidate for support through CfDs, although to date no CfDs have been offered for this technology. The EMR proposals were criticised, in effect, for putting forward an egalitarian argument as a facade to promote nuclear power. One submission to the consultation on the initial EMR proposals commented: *'The government claims that the intention of the EMR is to encourage low carbon investment. However, it seems to us that the overarching aim of the EMR from the Government's perspective is to enable the building of new nuclear power...'* (Mitchell et al.2011).

Hierarchy: In general, the year 2010 saw a realisation by government circles that the energy security and climate change public goods were not going to be delivered by sole

reliance on the individualistic bias upon which liberalised energy system had so far been based. EMR was therefore proposed on the basis of incorporating more hierarchy in the context of individualistic competition We categorise seven instances where the EMR system represents a more hierarchical system of managing policy for the electricity system than existed before.

First, (in the autumn of 2010) the Treasury took control over the total amount of levies on electricity bills to support low carbon energy. According to a report issued by the National Audit Office (NAO 2013, 4):'*The key objectives of the government's energy policy are to ensure a secure energy supply, to meet statutory decarbonisation targets and to keep the cost of energy affordable for consumers.'* To achieve this, the government had sought to set prices paid for electricity from specific technologies and had imposed levies on electricity suppliers to support investment by redirecting funds. As these costs would invariably be passed onto consumers, the Treasury and DECC had concluded that a framework was required to minimise the costs to industry and the consumer. Alongside the publication of proposals for EMR there was a commitment to exert government control over the amount that was spent on promoting low carbon fuels. This represents a hierarchical effort to limit ambitions to decarbonise the electricity supply to what was deemed affordable by the Treasury. This is in contrast to the open-ended nature of spending envisaged by the RO. Although DECC still had some latitude to decide how to slice up the cake between low carbon fuels, the Treasury was interested in controlling the amounts of money that would be paid by consumers for low carbon energy via a mechanism called the 'Levy Control Framework' (LCF).

Second, in the 2011 White Paper (DECC 2011, 45) the Government excluded nuclear power and CCS from auctions on the grounds that these technologies had 'less mature markets with fewer participants'. So-called 'investment instruments' were devised through which precise terms and conditions were negotiated with selected generators for specific

schemes. Prominently featured is EDF Energy's scheme for Hinkley Point C, the first plant in the planned nuclear construction programme. Hinkley C would supply around 7 per cent of Britain's electricity from two reactors. Contractual terms was provisionally agreed (but to date, not finalised) in October 2013, including a strike price of £92.50 (2012 prices) to be paid for 35 years subject to CPI indexation (HM Government 2013). Investment instruments were also issued to some large biomass and offshore wind power schemes. This was justified as being a transitional measure for large energy schemes.

Third, the government was gradually pushed away from a position of leaving precise technical choices for low carbon electricity generation entirely up to the market. The issue of investment instruments was part of this shift, but so was the Government's acceptance of a system of state guarantees for the CfDs. The CfDs are guaranteed through the 'Low Carbon Contracts Company' which is owned by DECC. From the evidence, including evidence to Select Committee hearings, it appears that pressure to provide greater regulatory certainty for low carbon technologies, especially nuclear, came from the electricity industry itself, rather than originating in Government or pressure from the Opposition (Energy and Climate Change Select Committee, 2011, 2012, 2013).

Fourth, the Government agreed to offer loan guarantees to cover substantial parts of the investment for selected low carbon generators, mainly nuclear power. However, the loan guarantees only cover part of investment cost and the risks of construction costs overruns were not fully underwritten by the Government. The Government was adamant that it would not 'underwrite' the construction risks of nuclear power investments, a position that Conservative Party politicians had consistently maintained (Hendry 2008). It maintained that the CfD mechanism was sufficient to lower the cost of capital incurred by would-be developers. This was despite pressure from supporters of nuclear power to underwrite construction costs..

Pressure increased on the Government to increase direct support for nuclear power after electricity companies began to pull out of the proposed nuclear power deals, starting in

early 2012. Indeed, by May 2013 all of the three initial nuclear consortia had fallen apart, with five of the six major British electricity companies withdrawing from the plans. The Government succeeded in re-selling two of the concessions and EDF re-structured its plans for the third. However, the start of construction of nuclear power stations was delayed. EDF has continued to back its initial plans at Hinkley Point C and possibly another project at Sizewell C. The French state controls a majority share in EDF and two state-owned Chinese nuclear companies have purchased minority stakes in the Hinkley C project.

There are two economic issues that have undermined prospects for nuclear development. One was that the estimates of the cost of nuclear power plants had increased dramatically following cost escalations in EPRs being built in Finland and France (Lévêqueand Rangel 2013).. Second was the reluctance of financial institutions to lend or invest money in nuclear power without firm - in effect state - guarantees against the risk of cost overruns. The Treasury agreed to offer £10 billion worth of loan guarantees for Hinkley C(HM Treasury 2013, 9), but this still left the developers to shoulder construction risk for the rest of the investment, including any cost overruns.

Once again, the DECC Select Committee was important in pressurising government to become more directly involved in the implementation of EMR. It accepted evidence from the nuclear industry and its supporters that favoured giving loan guarantees for nuclear development and recommended that the government carry out such demands (Energy and Climate Change Committee 2013). Loan guarantees were also considered in other cases, including a proposal to turn half of the large Drax B coal fired power station into a biomass plant (HM Treasury 2014).

Hence a fifth ‘hierarchical’ aspect of EMR was that in constructing and implementing legislation to advance the broad goal of secure low carbon energy, the choices of which schemes were awarded ‘investment instrument’ contracts were thus liable to influence by lobbies pressuring ministers and civil servants. This could even include non-energy considerations. For example, the Scottish Beatrice offshore wind-farm was awarded a

contract in the run-up to the referendum on Scottish independence following complaints over the lack of offshore wind contracts awarded to schemes in Scotland (Shankelman 2014). In addition, even when it came to auctioning renewable energy contracts, the first tranche of which were awarded in February 2015 (DECC 2015), the volumes of contracts issued to different technologies was decided partly by administrative means, because otherwise more contracts would have been awarded to the cheapest technologies, mainly onshore wind.

A sixth hierarchical aspect of EMR was the series of negotiations that the Government had to conduct on a supranational basis. This included in particular an application for 'state aid' to the EU for the Hinkley C development. The European Commission examined the agreement due to concerns that the deal represented illegal state aid and gave its consent in November 2014 (European Commission 2014). The construction of Hinkley C has continued to prove elusive, and no contract had actually been signed between EDF and the Government. This is associated with continued problems with the design and construction of the EPR in France and Finland, and an apparent reluctance of Chinese investors to commit to the deal due to uncertainties regarding costs (Critchlow 2015).

Throughout the process, the British government has displayed an attachment to 'individualistic' worldviews and tried to portray hierarchical interventions in terms of market mechanisms. Arguably, there was insufficient 'hierarchy' in EMR needed to ensure investment in the Hinkley C project, and that the necessary state support was to be provided by (French and Chinese) state-owned companies who could better absorb the risk associated with nuclear construction compared to private companies. However, even this proved problematic.

A seventh example of the state's new hierarchical actions comes with the inception of the 'capacity mechanism', a device seen as especially important in light of growing fears that there would be insufficient electricity generating capacity to 'keep the lights on'. Although The Department of Energy and Climate Change (DECC) took responsibility for decisions

regarding how much capacity would be required and when it would be required (Davey 2014), many regard the impact of the capacity mechanism (so far) as being marginal and of questionable utility (Hope 2014).

Conclusion

This article contributes to the literature on regulation of public goods by showing that design of regulation results from tensions between different ideational inclinations. Cultural theory was used to explain how the programme of EMR represented a shift in the governance of the British electricity system from an individualistic, market orientation to one that is more hierarchical in nature and permits greater state intervention. Overall, EMR involved a number of changes to involve more governmental influence over technology outcomes. Egalitarian bias is implicit in the drive for decarbonisation. The egalitarian pressure for renewable energy from environmentalist groups has been strong. Despite being supported, perhaps most strongly by authorities such as the CCC, as a means of also reducing carbon emissions, nuclear power is perhaps more firmly driven in political terms by the emphasis on energy security, since this connects up with establishment priorities and a 'hierarchical' conservative desire for order. Nuclear power also requires hierarchical cultural bias for its implementation, something that is difficult to implement in Britain's liberalised energy markets. There is a conflict with the 'individualistic' bias that is inherent to the design of Britain's electricity system, and which is still ensconced in EMR design.

In the electricity market the government does not determine the price, it merely offers a guaranteed premium for low carbon technologies, and there is no direction to invest in specific projects or even technologies. There are merely incentives. This set-up is very distinct from the old arrangements under the nationalised electricity system. It is also different from the centralised decision-making desired by some supporters of nuclear power. There are fewer conflicts between successful deployment of renewable energy and

the dominant market ethos of the electricity system. In this case, it seems that egalitarian bias is less inimical to individualistic bias, at least in part due to the fact that while renewable energy does need incentives and rule-changes, it does not require such hierarchical means of regulation to effect its implementation.

As the arrow of policy has pointed towards seeing electricity as the provision of 'public goods' and not merely as the production of a tradable commodity at the cheapest short term consumer price, there has been a retreat from the 'minimalist' 'market efficiency' based regulation. Under EMR there has been a marked increase in government involvement in decisions about technology, pricing and even some specific projects. The framing of this shift from 'individualistic' to hierarchical management of the electricity industry helps us to categorise and define the changes. It also helps understand the limits to this process. EMR does not begin to approach a return to the conditions of a nationalised industry whereas state-owned corporation made investment decisions at the behest of politicians.

The individualistic cultural bias that continues to underpin the electricity system has provided a barrier to a revived nuclear power programme. Identifying new patterns of governance as hierarchical and/or egalitarian leads us to understand that policy aims such as energy security and decarbonisation are in fact public goods and as analogous to health, education and welfare policies; in that they are defined by 'hierarchical' and 'egalitarian' political and administrative means.

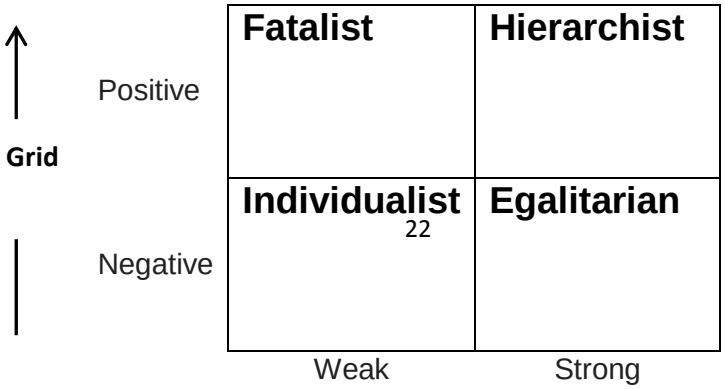
These public goods are defined and constructed through political lobbying and intra-governmental discussions about allocations of resources. Moreover the costs of providing these public goods may be uncertain. Different balances of cultural bias in administrative organisation will be required to achieve different types of technological and public goods outcomes. This is particularly pronounced in a field such as electricity where the structure

of regulation has a dramatic effect on technological choice. In the instance of EMR, the government has only been partly dragged away from its 'individualistic' prejudices.

In particular, the delivery of public goods may be problematic when attempts are made to deploy hierarchical means to fit in with competitive individualism. This is clearly demonstrated in this case where nuclear power depends on hierarchical arrangements to be successfully delivered. It may be that the trend of cultural bias towards individualism means that renewable energy, which may be more able to fit in with such bias, is given a relative advantage in the competition to take advantage of incentives to favour low carbon technologies. Egalitarian objectives can be reconciled, at least sometimes, with individualism.

'Hierarchical' and 'individualistic' cultural biases can (simultaneously) dominate different policy areas of government e.g. policing (hierarchy) and, say, financial markets (individualism), but trying to combine hierarchy with individualism in the same policy zone is more problematic. Policymakers must fit the cultural framing to suit their preferred (public good) outcomes rather than expect a defined public good to emerge from a preferred mix of cultural bias.

Figure 1 Different types of cultural bias in social organisation




Group

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