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UK Electricity Policy Mix in Flux: Paradigm Ambivalence and Institutional Shift

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Abstract

As an empirical characterisation of the UK electricity policy mix change during 1990s-2012 by conducting 53 semi-structured interviews with experts and the analysis of almost 250 consultation responses submitted, the present paper contributes to policy mix framework literature by extending the recent conceptual framework provided by Rogge and Richardt (2016) for policy mixes, in two dimensions of policy paradigm and policy institutions. Conceptualization of policy mix with the components of policy paradigm and policy institutions add irreplaceable analytical aspects to our understanding of policy mixes and policy changes.

Keywords: Policy change characterisation; Policy strategy and preference; Policy paradigm; Policy institutions; Socio-technical systems.

1. Introduction

While many have drawn attention to the continued change in the UK electricity policy, there is no common understanding of either the level of 'profundity' or the 'type' of those changes. This is reflected in diverse ways of labelling different changes. On the one hand, a range of approaches measure the level of changes from a 'profound change' (DTI, 2003) to a 'new energy paradigm' (Helm, 2005, 2007) and a 'ground breaking change' (FoE, 2008). Similar accounts of far-reaching change have been characterised by the vague term 'energy transition' (DECC, 2009a) as well as 'the biggest transformation' and 'once-in-a-generation fundamental reform' (Harvey, 2012).

Others have rejected these accounts of a fundamental shift in the UK electricity and energy policy. They highlight the existence of a 'remarkable resistance' and 'bands of iron' that have 'locked in' the UK electricity policy from actual transition (Kern, 2010; Kern and Mitchell, 2010; Kuzemko, 2011; Mitchell, 2008). These arguments are

manifested under such statements as ‘still no paradigm shift has happened’ (Kern, 2010; Kuzemko, 2011; Mitchell, 2008). Similarly, a group of interviewees, mainly from a STS perspective, insist that there is yet ‘no actual reform’ and ‘still very little has changed’. Consistently, Pearson and Watson (2012) point out that, despite several changes, ‘to some extent, we have been here before’.

Whether or not changes are measured as significant, there are other types of labelling focusing on characterising policy changes. Instead of just measuring the level of change, they point to the types and aspects of change. From this viewpoint, the changes in the UK electricity policy could be characterised based on a set of analytical features. They range from conventional IPE questions about ‘state-market’ ideas (Helm, 2005; Rutledge and Wright, 2011) to debates about change in policy objectives and their hierarchy (Mitchell, 2008). Similarly, issues like shifts in the socio-economic role of energy (Kuzemko, 2011; Pearson and Watson, 2012) and the alterations in energy technology and innovation policies (Kern, 2010; Winskel, 2012) have also been taken separately into consideration.

Indeed, changes in the UK electricity policy have been described in a wide range of different and even contrasting ways. Such diversity reveals varying, albeit ambiguous, models of change assessment. A common problem in such statements is that it is rather unclear what they overtly mean by policy change and what are the criteria they have measured policies against. Though, all statements do acknowledge that there are some changes in the UK energy and electricity policy. Indeed, in the absence of a clear definition of policy change, it seems that such conclusions are mainly based on a ‘normatively biased’ assessment of ‘what kind of change should happen’ (Kuzemko, 2011).

By providing an understanding of the UK electricity policy change from the early 2000s to 2012, a conceptual framework was developed in parallel to the recent conceptual framework provided by Rogge and Reichardt (2016). While these two share most of their components, the components of policy institution, policy paradigm and policy preference (policy strategy), which was analytically deemed necessary in the current case study, are absent there. In fact, it is claimed that current features of the UK electricity policy still do not fulfil all the characteristics of a wholesale *paradigmatic shift*, as it was the case notwithstanding the introduction of Electricity Market Reform (DECC, 2011), as a '*politically determined*' and '*technology specific*' policy 'transformation'. By answering the question of *what* changes have occurred and the having the resulted complemented framework in hand, the paper paves the way for further explaining *why* and *how* those changes emerged.

2. Methodology and proposition development

The present paper is a partial outcome of a PhD dissertation, which was based on a combination of reviewing secondary materials, analysing the content of almost 250 responses submitted to the DECC consultation call in December 2010, working papers and comments published by stakeholders or academic intellectuals, and 53 interviews conducted. Nevertheless, as analysis proceeds towards the period of Electricity Market Reform (EMR), the greater analytical weight is attached to the original evidences, like interview materials. Whereas, the analysis of policy changes in the early 2000s, by contrast, is largely based on policy documents and some secondary studies. Likewise, it is the case for analytical distinction between electricity and energy policy, and technology policy too. Whilst their changes are hardly discernible in early stages, there is clear shift towards an electricity-specific policymaking since the late 2000s.

It is noteworthy to remember that the paper is primarily intended to answer the descriptive research question about how one could characterise and measure changes in the UK electricity policy between 2000 and 2012. In particular, it focuses on the most recent changes represented in the case of EMR, by asking the followings:

Questions: Is EMR a policy change? If so, *what* are the extent and aspects of the change? And if there is necessity regarding update or extension of current analytical policy mix frameworks? If so, in *what* elements?

Building upon the incorporation of insights from transition literature into policy change studies, the proposition provides a framework facilitating a more comprehensive understanding of the UK electricity policy change, which would be followed by empirical examination of the applicability of that framework in more than a decade of history of the UK electricity policy change. As discussed, there are some theoretical complementarities between technology studies and policy change literature. On the one hand, based on the original work of Hall (1993) and the Advocacy Coalition Framework (Sabatier and Jenkins-Smith, 1999), current policy literature presents a four-level model of policy components to characterise policy changes. It includes policy paradigm, objectives, institutions and instruments. Nevertheless, regarding the nature of the electricity system as a 'large-technical' and 'techno-centric' subsystem, current policy frameworks suffer from an analytical shortcoming in taking socio-materiality and the technological preference of electricity policies into account. This problem is even more challenging with respect to a shift in the substance of UK electricity policymaking. In particular, EMR represents a clear move from a '*technology neutral'* electricity policy to a '*technology specific*' and '*delivery focused*' generation of policy.

On the other hand, the Socio-Technical Transition literature (STT) is supposed to provide a 'comprehensive account' of technology change in complex socio-technical systems. It points to the logic of *'lock-in'* and *'path dependency'*, in which a combination of socio-technical configurations constrains or favours particular technological pathways. For the UK electricity system, as an example, such socio-technical design is widely understood by interviewees as a set of specific features like *centralised* fossil fuel generation, dominated by *large-scale* technologies, designed to be supply oriented and structured around big and vertically integrated utilities. But, in return, STT has received long-standing criticism in failing to capture well the political complexities of the transition

process. Its approach has been widely contested for a so-called 'de-politicised' and 'technocratic' account of technological transformation (Kern and Howlett, 2009; Kern and Smith, 2008; Meadowcroft, 2009; Shove and Walker, 2007; Smith and Stirling, 2007).

Together, the policy change framework and STT could open up an analytical possibility of characterising policy changes, more rigorously, in 'large-technical' and 'techno-centric' subsystems such as the electricity system. The main argument here, encapsulated in the research proposition, is that, without considering shifts in the characteristics of socio-technical systems, the full characterisation of policy changes is yet analytically incomplete. Accordingly, table 1 provides a visualised summary of an improved framework that is proposed for both characterisation and measurement of change in techno-centric subsystems.

Proposition: *In 'techno-centric' policy subsystems, the characteristics of socio-technical systems constitute a significant component of policymaking. They should be taken as an independent policy component in characterising and measuring policy changes, called here technology preference.*

Table 1- The completed five-layered framework of policy mix for 'techno-centric' subsystems

Policy Change levels	*Policy components and characteristics (modified Hall's model)*				
	Policy instruments	*Policy institutions*	*Technology preference (socio-technical configuration)*	*Policy objectives*	*Policy paradigm*
Minor change	✓	Probably	Probably	_	_
Major change	✓	✓	✓	Probably	_
Paradigmatic shift	✓	✓	✓	✓	✓

The research organised as the following. First, in order to contextualise the case of EMR in a 'full policy cycle', the next section examines the proposition through a historical analysis of policy evolution during the first decade of the 21st century. As a result, that section characterises UK electricity governance in the late 2000s as the policy context in

which EMR has been shaped and against which its profundity ought to be measured. Analysing policy documents and reviewing secondary material cross-checked with complementary interviews are the main empirical data sources the section rests on.

A further section focuses exclusively on the EMR policy process. Across its sub-sections, it tries to sequentially describe the EMR formal process, briefly explore its policy components and mechanisms, and analytically identify its either changing or continuous aspects. This section is largely built on the content analysis of almost 250 responses submitted to the DECC consultation call in December 2010, working papers and comments published by stakeholders or academic intellectuals, and 53 interviews conducted by this research. The process tracing method has been partially used to structure the argument overall. At the heart of the section's analytical target is measuring the degree as well as characterising the type of actual changes in the UK electricity policy by 2012. The discussion section discusses the applicability of the proposition in the UK context and provides a framework for policy mix having the case applied to. Finally, a summary and conclusions will come under the last section.

3. First decade of 21th century: UK electricity policy change (2000-2010)

Policy change is not a single event, but a process over time. Given that policymaking is a 'long-frame' and 'strategic' process, it needs to be analysed in a 'full policy cycle'. This means a wider context of long-term policy evolution and change that allows 'operationalisation of falsifiable hypotheses' and 'smoothing out short-term fluctuations' (Szarka, 2010). The ACF offers a minimum period of 'a decade or longer' for studying a policy change (Sabatier and Weible, 2007).

Therefore, to contextualise EMR in a time frame when its policy seeds started to get planted, and albeit ought to be measured against as well, this section focuses on an

analysis of almost the last decade of the UK electricity policy. In order to examine the proposition, the paper applies the developed framework shown in table 1 on different stages of the UK electricity policy since the early 2000s. It is worth noting that although EMR is an electricity-specific policy package, it is analytically difficult to differentiate between electricity policy and wider energy policy in the context of the UK. In fact, EMR is a result of a recent shift in policy attention towards the power industry as the main driver of broader energy targets. Therefore, the unit of analysis is inevitably the overall energy policy changes. Perhaps, wherever it is distinctive, the focus of analysis has been made on electricity-specific policies.

3.1. The policy re-birth and modest policy implications (the early 2000s)

In 1997, when the Labour party won the election, some changes in the UK electricity policy started to emerge. The publication of a series of high profile reports, particularly the Royal Commission on Environmental Pollution (RCEP, 2000), showed that environmental issues had got more political significance. This pattern led to an Energy Review in 2002 (PIU, 2002). It upgraded the concern of climate change in energy policy with a set of 'ambitious' policy recommendations. As a conservative response, the DTI published the 2003 Energy White Paper, which highly compromised on radical aspects of the PIU report and continued with commitment to pro-market energy governance. Therefore, the dominant liberalised policy *paradigm* remained intact. This was similar for *governance structure* as well. The PIU's recommendations for a new department were rejected by the 2003 White Paper. Therefore, no major *institutional* change occurred, except establishing some low carbon technology institutes such as the Carbon Trust and the UK Energy Research Centre.

The main important change in that period took place at the *policy objective* level. For the first time, emission reduction and affordability targets were added to the mixture of competition and security. However, the practical impact of those new targets on other levels of policymaking was constrained due to their imprecise and vague wording: '… to put ourselves on a *path* to cut the UK's carbon dioxide emission…' (DTI, 2003). Actually, there remained some 'wriggle room' for further negotiations and interpretations.

In terms of *policy instruments,* while the main direction was consistent with market-based mechanisms, some new instruments were introduced. Firstly, as a result of political criticism of the pool market, it was replaced by a 'voluntary bilateral contracting' design in 2001, The New Electricity Trading Arrangement (NETA), which then was extended into the whole UK in 2005 and entitled British Electricity Transmission and Trading Arrangement (BETTA). Secondly, in continuation of remarkable efforts to bridge economic incentives and climate targets, a set of complementary policy instruments emerged. The replacement of Non-Fossil Fuel Obligation (NFFO) with the Renewable Obligation (RO) was a clear example. Similarly, the introduction of the European Emission Trading Scheme (EUETS) in 2005 intensified the UK momentum of climate policy. Apparently, both RO and EUETS were supposed fully compatible with market principles.

With regards to the *fifth* policy component, despite continuous dominance of technology-neutral policymaking, some spaces began to open up. The 2003 White Paper drew a *prospect* of future technology mix. It highlighted the role of renewable and energy efficiency, rejected the attractiveness of nuclear and coal, and emphasised gas as a transition option. Furthermore, by the introduction of RO and the 're-emergence of the UK energy innovation system' (Winskel and Radcliffe, 2012), a form of modest

innovation policy started to emerge. Nonetheless, in practice, these changes were still marginal to mainstream fossil fuel generation. In terms of other socio-technical dimensions, the UK electricity policy was still characterised as centralised, large-scale and structured around big companies. The introduction of NETA, in particular, resulted in a 'coupled consolidation' of 'an oligopoly' and 'vertical integration' undermining real competition (Henney, 2010, 2011).

As such, given the level of institutionalisation, the pro-market energy governance showed a high degree of policy resilience and path-dependency. Consequently, even in the case of the *re-birth* of energy policymaking and a potentially significant change in policy objectives, they were accompanied neither by new instruments nor by change in the machinery of state. Unsurprisingly, the technology preference was also affected marginally.

3.2. Re-prioritisation of objectives and the process of contestation (the mid-2000s)

Contrary to the complacent presumptions of the 2003 EWP, in the mid-2000s a combination of dramatic changes in the domestic and international context of the UK energy system raised serious concerns about the 'security of supply'. The pattern of energy 'securitisation' raised a high level of public expectation for a state role in ensuring access to energy as, once more, a national strategic asset. This concern then resulted in a plethora of policy documents including the 2006 Energy Review (DTI, 2006), the report published by Joint Energy Security of Supply (JESS, 2006) and eventually a new Energy White Paper in 2007 (DTI, 2007). Nonetheless, despite opening up some space for questioning the over-reliance on the pro-market policy paradigm, energy security was still understood to be the natural function of a competitive energy market (DTI, 2007; FCO et al., 2004).

For the first time since privatisation, the hierarchy of *policy objectives* shifted fundamentally whereby energy security jumped to the top, even above the competitive market. But subsequent changes in policy components remained limited mainly because of not blaming pro-market governance. There was a very minor *institutional-structural* shift. Despite the re-politicisation pattern and increasing demand for state interference, in practice only some marginal capacities were added to the relevant departments and policy debates began to broaden out into other voices not previously involved in energy policymaking. Similarly, *policy instruments* remained committed to the market-based mechanisms. Alongside NETA/BETTA, a new version of RO was also introduced.

The condition for *technological preference* was slightly different. As a natural response to a geopolitically informed security concern, a clear shift occurred towards a more 'home-grown' and domestically produced energy portfolio. Although this strategy included renewable energy and coal as well, it was a more significant change in terms of nuclear energy, compared to the 2003 White Paper's rejection. The 2007 Energy White Paper's supportive approach was complemented by the Nuclear White Paper (BERR, 2008). Similarly, the UK approach to the emerging CCS technology was also encouraged. Such 'centrally planned' innovation policy is called 'breakthrough style' by Winskel and Radcliffe (2012). Having characterised both nuclear and CCS technologies as centralised large-scale supply options, it would be apparent that there was no major change in socio-technical preferences towards either decentralisation or disruptive small-scale technologies. Furthermore, despite growing technology-specific policy rhetoric, no supportive policy was officially introduced, nor was the predominant market principle of technology neutrality seriously challenged: 'it would be for the private sector to fund, develop, and build new nuclear power stations' (DTI, 2007).

Overall, while the energy policy paradigm was deeply 're-politicised' and policy objectives were re-prioritised, the 2007 EWP kept policy advice firmly within the boundaries of market-led energy governance. The main changes in that period were limited to the process of *securitisation* and consequent *re-politicisation.* Nonetheless, it is undeniable that such provocative set of anomalies and contradictions triggered a process of public *contestation* of existing framework of energy policy and governance.

3.3. Target-setting and institutional reconfiguration (the late 2000s)

As a direct result, the dominant liberalised *policy paradigm* was gradually displaced in favour of a more interventionist approach. Eventually, an unprecedented plethora of obligatory policies and legislations was brought about including the Climate Change Act (DECC, 2009a) and the 'European-led' Renewable Directive (EC, 2007). A clear distance from liberalisation narrative then became visible in several published policy documents. As an example, the UK Low Carbon Transition Plan (DECC, 2009a) clearly reflected the 'culmination' of an 'interventionist industrial strategy' (Scrase et al., 2010; Skea et al., 2011). Instead of an entire rejection of the market's workability, the new mixed approach questioned the adequacy of market paradigm in meeting challenges on such a scale of de-carbonisation (Scrase et al., 2010). Though, there was also an interpretive shift in the socio-economic role of energy with the emergence of a mixture of 'energy-climate nexus' (Kuzemko, 2011). Indeed, what had shifted from a normalised commodity to a national asset, in the mid-2000s, now was expanded to include climate issues as an indispensable part of the energy system.

Having signed the Renewable Directive and published a new series of policies, like the UK Low Carbon Transition Plan and the UK Renewable Energy Strategy (DECC, 2009a, 2009b), arguably a major shift in policy discourse started to emerge towards a form of

technology-specific policymaking. Consequently, Winskel (2012) points to the construction of 'a *serious interest* in technological innovation' and the process of *'re-energising'* the UK energy innovation system as two major changes that occurred. In terms of generation mix, for the first time a particular generation option, 'home grown' renewable, was understood as a dual answer for both climate and security concerns (DECC, 2009b). Nonetheless, this period witnessed a range of minimal *instrumental* changes, from 'banding' in RO to introducing small-scale Feed-in-Tariff. In practice, none of them was able to shift the technological balance fundamentally away from locking into the fossil fuel system. Likewise, despite political temptation towards decentralised community-based energy policy due to the process of devolution and the discourse of 'localism', such ideas did not get enough institutional momentum in the context of financial recession and ambitious change imperatives.

Overall, from five levels of policymaking constructed in the framework applied here, by the late 2000s new policy objectives had been institutionalised and governance structure had shifted substantially. There were also some forms of change at the policy paradigm and policy instrument level, albeit less significant than a 'clear break from the past'. While the former implied the displacement of an ex-paradigm, a greater role for government and a mixed 'energy-climate nexus', there was no cohesive alternative interpretative framework instead. The latter, similarly, altered existing design of RO and added new mechanisms like FiT, but just in small-scale technologies, and the dominance of market-based and fuel-blind instruments was never practically challenged. More importantly, there was very minimal shift in socio-technical preference. In spite of some new technology-oriented policy narratives and marginal mechanisms, neither generation mix nor system configuration witnessed any significant alteration. It means, the then

electricity system was still largely technology neutral, heavily locked-in unabated fossil fuel centralised supply, and dominated by an 'oligopoly' of the Big Six with 'cross-ownership' and a 'vertically integrated' structure. In short, that status fell far behind a comprehensive paradigmatic shift that needs to be represented in significant alteration an all policy components. Regarding the centrality of targets and new structures at the heart of the governance system, I would call this a period of *target-setting* and *institutional reconfiguration*.

4. 2010 onwards: Period of regulatory reform and technology delivery

Given the significant shift in obligatory policy objectives and governance institutions, a new set of practical questions began to arise: So, what's next? Who is responsible for delivery, and how? In the late 2000s, the accumulative desire for policy change was a signal for an end to a long period of 'complacency' and 'over-optimism' about meeting targets and new challenges through 'business as usual' with only parsimonious instrument modifications. In fact, a combination of escalating challenges, legally binding targets and disappointing results collectively shifted UK electricity policymaking *beyond* high-level policy debates of setting targets and restructuring governance departments. Instead, in the early 2010s, the focus moved towards issues around *practicalities* and *technicalities* of an on-the-ground delivery. There was a transition from policy rhetoric and 'energy targetism' (Newey, 2012) to practical reforms and getting hands dirty.

The first practical shift was a turning focus on power generation as the central solution to meet overall energy objectives (CCC, 2008; DECC, 2009b). In addition to a near carbon-free with 30% renewable electricity system, growing security and affordability concerns also emerged. Consequently, a series of warning policy documents and reports during 2009-2010 addressed such electricity-related concerns. Ofgem's Project Discovery (2009), the Treasury's Energy Market Assessment (HMT, 2010), and the CCC's Step

Change (2009) report were the main instances. More importantly, this pattern eventually led to the Coalition Agreement (HMG, 2010) which politically endorsed the aim of 'energy market reform to deliver security of supply and investment in low carbon energy'. Though, its detailed suggestions framed almost all policies that came afterwards.

Collectively, albeit from different points of view, such important policy documents deeply disputed the adequacy of 'current market arrangements' for meeting electricity targets. That market was understood to be incapable either of attracting enough investment or of directing investment towards low carbon technologies. Thereby, a growing demand emerged for some form of reform in the power market. It was the first time since privatisation that the central concerns of electricity policy were about how to *deliver* investment and via which *technological pathways* this should be done.

Electricity Market Reform primarily seeks to meet the above concerns. Therefore, the rest of this section aims at providing an analysis of the changing characteristics of EMR. The main question here is to what extent and in which aspects EMR could be regarded as a major policy change? Has EMR fulfilled the requirements of a paradigmatic shift? It is worth noting that the results of this section are largely based on the content analysis of stakeholder comments submitted in response to the EMR consultation call (DECC, 2010) and are cross-checked with 53 interviews conducted with policymakers, business representatives, consultants, civil activists and energy experts who were involved in the policy process of EMR.

4.1. The introduction of a new package of policy instruments

In response to the growing recognition that current electricity market design was unlikely to meet the government's electricity-specific targets, the DECC launched a consultation on Electricity Market Reform (EMR) in December 2010, which resulted in the White Paper (Planning our electric future) in July 2011. Since privatisation in the 1990s, EMR was the third and arguably ‘the most fundamental’ shift in the design of the UK electricity market. It was basically proposed to reassure investors about the profitability of low

carbon electricity supply investments with maximum de-risking characteristics. The White Paper was followed in order by the Technical Update (December 2011), the draft Energy Bill (May 2012), the pre-legislative Parliament scrutiny (July 2012), and finally the Energy Bill (November 2012). Since EMR is yet, at the time of writing in mid-2013, an ongoing process until implementation in 2014, it is still difficult to assess the extent of further likely changes. By the end of 2013, technical details will be more elaborated and Royal Assent on the Energy Bill is expected. Indeed, it is still 'too early to judge' its practical consequences. Therefore, what this research means by EMR relies mainly on the published documents: the EMR White Paper (DECC, 2011) and the Energy Bill (DECC, 2012a).

The EMR policy package rests on four pillars of policy instruments introduced to either replace or complement major existing mechanisms. Firstly, the Feed-in Tariff with Contract for Difference (FiT-CfD) was designed to replace RO with not only a more *interventionist* mechanism, but also one more *inclusive* to nuclear and CCS alongside renewable energy. The CfD is arguably 'the main mechanism of EMR', whereby a fixed 'strike price' is determined for the different low-carbon technologies. Then, through a long-term contract, its difference with average market price is paid to or charged from the generator. Another central proposal of EMR is the Capacity Mechanism (CM). This is a security-specific mechanism ensuring an adequate flexible peaking supply. The third policy instrument is an Emissions Performance Standard (EPS). It functions as a 'bolstering regulatory back-stop instrument proscribing fossil fuel generation, particularly unabated coal' (Cornwall, 2012; Green Peace, 2011; Newbery, 2011). Finally, the Carbon Price Floor (CPF) has been proposed to complement EUETS which has become gradually 'useless' due to the volatility of the price of carbon and the 'lack of European political

commitment' (Newbery, 2011). Although the 2012 Energy Bill has kept the main features intact, it has also proposed a contracts counterparty body and a Cap of the Levy Control Framework (LCF).

4.2. Beyond targetism and the 'trilemma' of electricity-specific policy objectives

Despite a politically controversial debate in the process of the 2012 Energy Bill (DECC, 2012a) and the subsequent amendment proposal for setting a de-carbonisation target for 2030, EMR eventually does *not* indicate any electricity-specific policy objective, a fact that reflects an intentional distance from what is so-called 'energy targetism'. Nonetheless, EMR is, by no means, a target-free policy package. The overall design of EMR seeks to materialise sector-specific translations of legally binding energy targets. Firstly, the prospects of near-complete de-carbonisation of the electricity supply as well as 30% renewable power have predominantly inspired the expectations that EMR is to address. It is almost the same for new security concerns derived from the risk of power blackout and under-investment. As the second objective, this implies that EMR is expected to attract almost £110 billion in new investments by the next decade. Finally, the growing concern of affordability and energy cost in a period of austerity is increasingly gaining political momentum as another mainstream policy objective. Together, these three distinctive objectives shape a complex mix of competing objectives that is commonly referred to the energy policy 'trilemma' (Bolton and Foxon, 2013; Boston, 2013; Foxon, 2013; Winskel, 2012; Winskel and Radcliffe, 2012). The interaction and trade-offs between these multiple policy priorities form a 'multi-dimensional energy policy riddle' (McIlveen et al., 2010). Consequently, the fact that EMR attempts to '*reconcile diverging policy objectives'* has resulted in a 'convoluted, complex, messy and risky' status. The senior member of EMR at the DECC envisaged in an interview that 'it

is our view that Ministers need to make the ultimate *trade-offs*, because some of these trade-offs are quite big between the environment, cost and security of supply…'.

Technically, this trilemma is clearly reflected in the level of complexity EMR contains. To some extent, three out of four EMR mechanisms are primarily related to the de-carbonisation objective: CPF, EPS and CfD. The CfD is also the core instrument for incentivising low carbon generation. In turn, the Capacity Mechanism (CM) is directed towards ensuring supply security. In contrast, EMR is still critically scrutinised for the lack of full attention to the affordability concern. The introduction of the Levy Control Framework in the Energy Bill (DECC, 2012a) is seen an attempt to 'limit the direct financial impact of EMR on bills' (Steward, 2013). Also, in 2013, the Government is going to define the scope of an exemption for energy intensive industries from the costs of Contracts for Difference (BIS and DECC, 2013). Overall, the majority of people interviewed thought that the original design of EMR in the 2011 White Paper had prioritised 'climate and security objectives over competition and affordability concerns'. Though, this balance has changed since then, during the long policy process that still continues.

4.3. Towards a more state-led governance structure

From an institutional point of view, while EMR does *not* explicitly impose any specific structural change, it clearly underpins the design of the late 2000s. Arguably, it would further shift the balance of power from market and independent regulator, Ofgem, towards government and the DECC in particular. As a senior director in Ofgem described during a lecture in July 2012, 'EMR was likely to fundamentally change the *Government's role* in energy generation and delivery and the arrangements would place the Government in a quasi-procurement role'. He felt that the Government's role in EMR

had landed towards the more radical end of what had been put forward a few years before in Project Discovery and that EMR now is a 'government-controlled policy'.

By the introduction of an Institutional Framework (DECC, 2012b), EMR declares the exact responsibilities of departments involved in which all are expected to be accountable to the DECC. More importantly, in the Energy Bill (DECC, 2012a), EMR introduced a governmental body that is functioning as the contracts' counterparty. Regardless of further technical details, this new structure would cause a more direct involvement of state 'delving into the heart of energy policy'. Even within the DECC, setting up 'dedicated offices' for the main low carbon electricity technologies facilitated explicit government technology strategies and policies. What is more, the DECC now has a more active involvement in co-ordinating centrally diverse technology institutes and energy innovation policies.

Such strategic power of the state is not limited to the DECC's institutional boundaries. There is an increasing pattern of Treasury's involvement in energy policy as well. In addition to Treasury's control over subsidies and contracts, it also represents the political voice of Conservatives in the Coalition energy policies: 'Energy policy decisions are not made in the DECC [exclusively] – they are made in the Treasury [as well]'. The setting of financial limitations for the Levy Cap in the Energy Bill (DECC, 2012a) and the introduction of the Gas Generation Strategy (HMT, 2010) are just two examples of how influential is the role of Treasury. As another example, when I participated in an event organised by the Westminster Forum about EMR, the absence of a Treasury representative was strongly protested by attendees. They believed that every debate about EMR is inconclusive unless Treasury is playing an active role. As the former Chair of the Energy and Climate Change Committee warned, regarding the growing policy tension

between the DECC and Treasury, 'the Treasury could make energy policy *unworkable*' (Yeo, 2012).

4.4. Technology-centric policymaking and a resilient socio-technical configuration

The return of technology-related debates at the heart of UK electricity policymaking is seen as a unique feature of EMR. Indeed, EMR represents a substantial shift in the nature of UK energy policymaking. It primarily aims at articulating technically how to achieve the targets already adopted. In fact, it is a clear shift *'beyond target-setting'* and *'institutional reform'* towards *'technology-specific'* and *'delivery-related'* policymaking. The vital importance of technology preference in EMR was also reflected in most of the consultation responses in 2011. Indeed, supporting a particular technology, albeit differently depending on the stakeholder's position, was the central part of debates about EMR. It was also central characteristics for the DECC empowerment strategy in view of an EMR senior member at DECC that we need more *technical* skills, since we are really in EMR, absolutely in the transition from policy design to implementation and *technical delivery*.

This fact is in clear contrast with a long period of 'technology-neutral' policymaking in the UK liberalised electricity system that resulted in a fossil fuel based electricity system. As such, EMR is fundamentally a package to support a particular low carbon technology mix, i.e. nuclear, renewable and CCS. In contrast, EMR has not been primarily designed in favour of fossil fuels. Particularly, it is clearly a 'death' to unabated coal, whereas its consequences for gas are still controversial. Depending on further settings, there are different gas scenarios, from an entire abandonment as 'a base load option' (Oil and Gas UK, 2011) to another 'dash for gas' due to a so-called 'hole in legislation' and the design of EPS (CCP, 2011; FoE, 2011; Green Peace, 2011). This concern was hotly debated

during the Energy Bill process (DECC, 2012a). On the one hand, the rejection of the 2030 de-carbonisation target made the 'dash for gas' scenario more likely. It means, in EMR, there is a direct interrelationship between debates on de-carbonisation target and which technological pathway to follow. On the other hand, the coincident introduction of the Gas Generation Strategy (HMT and DECC, 2012) also increased the risk that the UK electricity system is becoming 'locked into' a new generation of gas infrastructure.

Apart from a substantial shift in generation mix towards a low carbon technology portfolio, EMR is changing less in other socio-technical features of the UK electricity system. Firstly, the overall direction in EMR is still in favour of a predominant centralised large-scale design: '[We do] not believe that decentralised and community energy systems can lead to significant replacement of larger-scale infrastructure' (DECC, 2011). This approach is also reflected in what Winskel (2012) calls a 'regime-led innovation policy' that focuses on 'shorter-term deployability, cost reduction, and swifter delivery' of incumbent-centralised large-scale technologies rather than on radical/decentralised small-scale technologies. Consequently, the current low carbon 'socio-technical regime' centred on 'big technologies' is more likely to get increasingly reinforced. EMR's centralised design has been mentioned in a remarkable number of stakeholder comments and interview discussions, mainly from energy experts with a technology and STS approach.

To sum up, while EMR aims to bring about a fundamental shift in generation technologies towards a low carbon mix, regardless of gas controversy, other features of socio-technical configuration would remain intact. At the end of the day, the UK electricity system is yet characterised as a centralised model, dominated by large-scale power plants, focused on the supply side and structured by big and vertically integrated

utilities. Even regarding the possibility of another dash for gas, EMR might still continue with a fossil fuel based generation mix. Regarding huge investments expected to come in place as a result of EMR, the unchangeable nature of the socio-technical system under proposal could technically lock the UK electricity system into a large-scale centralised design for further decades. This is another reason why the technical design and configuration of the power sector in EMR has attracted the attention of several spectators.

5. Discussion and framework development

Having reviewed the main features of the UK electricity policy since the early 2000s, this section seeks to shed light on theoretical contributions it makes and to draw some lessons from the studied case. Firstly, it tries to bridge between these empirical analyses and the adopted analytical lens. In addition, this section will offer some lines of theoretical contribution and analytical proposition for further research. This type of contribution is derived from an inductive approach to the case study and falls beyond literature-driven concepts that were hypothesised and encapsulated into the proposition.

5.1. Paradigm ambivalence and socio-technical lock-in

Having applied the proposed five-layered framework in more than a decade of the UK electricity policy evolution, it shows that despite several significant policy changes that have taken place, it is still *too early* to claim *a paradigmatic shift* in the UK electricity system. Over the last 12 years, the orthodoxy of the pro-market paradigm has been widely displaced, the socio-economic role of the power sector has been dramatically upgraded and expanded, a series of very ambitious targets have been crystallised, the governance structure has been substantially re-configured, a new mix of generation technology is expected to arise and a package of policy instruments are proposed to come in place. Nevertheless, the practical way that the electricity system operates and is structured as

well as the technological outcomes that it is supposed to bring about have not significantly shifted yet. There are also a lot of doubts about how significantly they would shift by the implementation of EMR.

This research argues that there are at least two main policy components that have never shifted enough. Whilst the current design has moved far away from the dominance of market ideas, it still suffers from a form of confusing *paradigm ambivalence*. It reflects the status that has been termed differently throughout the empirical study as 'hybrid design' (Bolton and Foxon, 2013) or 'the absence of ideology consistency' (Butler, 2013). The lack of an integrative-cohesive interpretive framework has led to a 'policy mess' which has widely affected other policy components of the UK energy system and governance. In addition, the main criticisms of the EMR proposal, such as 'over-complexity', 'uncertainty' and 'inconsistency' of the policy package, are arguably direct consequences of such paradigm ambivalence. Therefore, it seems unlikely that the UK electricity system could meet its adopted targets, unless a coherent and consistent policy paradigm not only frames, but also directs the entire governance system. Until then, a wholesale paradigmatic shift cannot be identified.

The second incompletely changed component is the socio-technical configuration of the UK electricity system. EMR aims substantially to shift the technological base of the power sector. Having assumed that it could reach the targeted low carbon technology mix despite the possibility of another dash for gas, it would not be seen as a fundamental shift in the UK electricity socio-technical system. On the basis of the current design of EMR, it clearly reflects a centralised perspective rather than a decentralised community-based system; large-scale generation technologies that are least disruptive; institutions that favour few big regime incumbents and limit real competition; and a focus on supply

almost regardless of the level of demand. In spite of remarkable criticism, the UK electricity system has been *locked into* this set of characteristics for several decades. This research argues that without moving away from such system configuration, a complete paradigmatic shift is far from coming about.

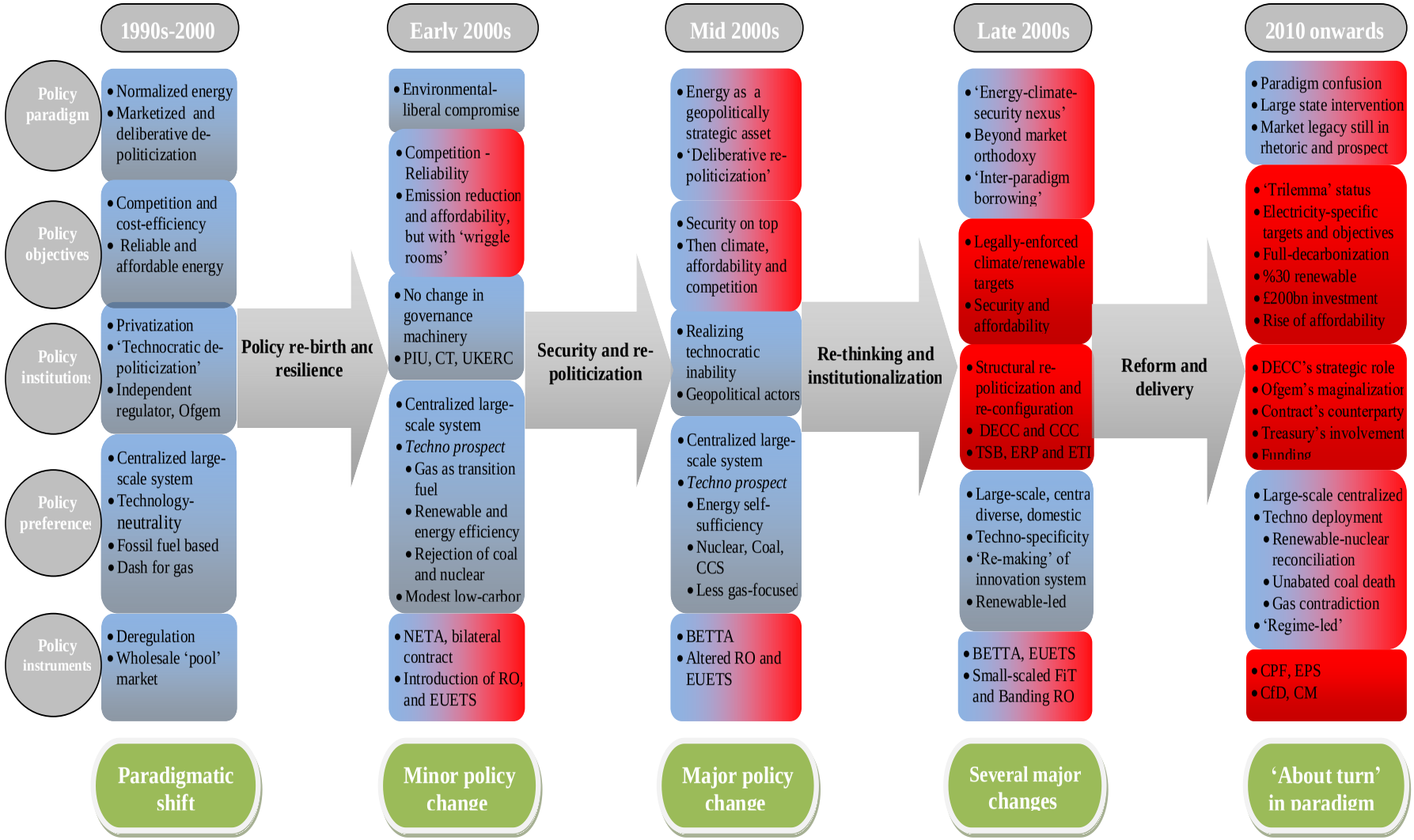

Figure 1: An overview of the UK electricity policy change (2000-2012)

This conclusion is in a direct contrast with similar studies that have tried to characterise current UK energy policy. Regardless of some differences in the time frame and the scope of research, most of them argue that the UK energy paradigm has shifted at all levels (Helm, 2005; Kern et al., 2014). This contrasting finding is potentially derived from either the different framework this research has applied or a longer-term analysis this research has undertaken – or even both. Figure 1 has tried to schematically summarise the UK electricity policy change for more than a decade. It is worth noting that while the changing colours present an overall alteration in those policy components, they do not, and cannot, reflect the detail levels and features of detected changes at all. This is a technique that aims at merely visualisation and simplification. Figure 2 provides the resulted policy mix framework based on the characterisation of policy changes in UK electricity in Figure 1 and the framework recently suggested by Rogge and Reichardt (2016). As it could be seen, overarching element of policy paradigm and policy institutions contribute to the update of Rogge and Reichardt's framework (2016), besides having policy preference renamed to match their terminology of policy strategy.

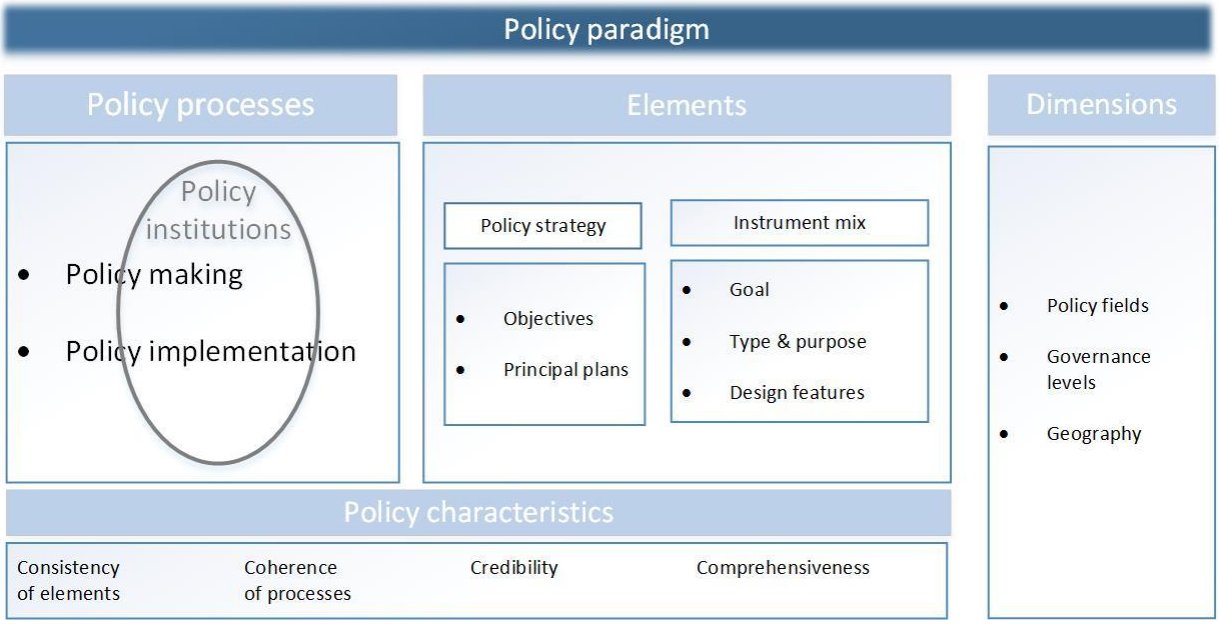

Figure 2. Extended policy mix concept, based on Rogge and Richardt (2016)

5.2. Socio-technical configuration as a policy component

As one of the early findings, this study highlights an increasing significance of technology in the post-privatisation UK electricity policy. Particularly in the case of EMR, technology preference fell at the *heart of policymaking* process. This is approved notwithstanding a long history of technology neutral electricity policy. The analysis shows that since the re-birth of energy policy in the early 2000s, technology preference has always been an inextricable component of the electricity policy mix. Although, due to the legacy of pro-market thinking, it was highly dismissed until the late 2000s, it then became clear that there is no actual electricity policy without a serious consideration of the matter of technology. This is the case, perhaps, with respect to the nature of the electricity system as a 'large-technical' or 'techno-centric' subsystem.

Therefore, this research provides enough empirical evidence for the claim that the inclusion of a technology-related policy component, as the *fifth* component, in assessing policy change is not only *applicable*, but also *crucial*. Otherwise, any framework aiming

at the characterisation and measurement of the electricity system change would miss an important, and arguably central, part of the analysis. Let us compare EMR, as an example, with the electricity policy of the late 2000s. Without taking changes in EMR's technology preference into consideration, EMR would represent almost what came before, with the addition merely of a set of new policy instruments. However, this analysis shows that technology-specific policymaking and a commitment to a new low carbon generation mix are the substances of EMR.

The incorporation of insights from Socio-Technical Transition theory also proved useful in providing a more systematic account of technological change in electricity policy. In other words, it seems analytically *naïve* to explain the dominance of a certain type of technology compared to others, unless taking socio-technical characteristics of the system into account. For instance, without paying serious attention to still dominant, centralised, large-scale features of the UK electricity system, it would be difficult to understand why EMR is primarily in favour of nuclear energy and big renewable options like wind farms, rather than other small-scale, decentralised technologies. Similarly, analysing socio-technical configuration gives us a comparative idea about why the UK electricity policy is so different from other countries with similar policy objectives, such as Germany. The exceptional dominance of the Big Six, as vertically integrated continental companies, in the structure of the UK electricity system, is another example. It explains why any new proposal gets tweaked in a direction that enables regime actors exclusively to benefit most from their centralised, large-scale resources and capacities. To summarise, it seems that the *choice of technology* in the electricity system is associated with policy dimensions about how the power sector is *organised, designed, structured, operated* and *controlled*. In other words, the *dominant design* of the electricity socio-technical system depends

heavily on inherited preferences and policy directions in terms of a set of institutional arrangements like the level of *centrality*, *scale*, *structure* and *generation mix*.

5.3. From 'technology preference' to 'policy preference'

The inclusion of a new policy component that represents socio-technical configuration is also consistent with what broader, i.e. non-technology exclusive, policy process frameworks suggest. Particularly, the recent version of the Advocacy Coalition Framework (ACF) (Sabatier and Weible, 2007) has introduced the concept of '*policy preference'*. This concept primarily means an '*overall solution*' and actual '*policy proposal*' required to meet adopted policy objectives. Indeed, the ACF assumes that policies should not only clarify their main objectives, but also need to determine *how* and via which *solutions on the ground* those targets are practically expected to be met. Perhaps policy instruments would then be designed to facilitate those overall strategies. In a similar argument, Lockwood (2013) points to the '*preferred system configuration*' as a dimension for political sustainability of policy change. Inspired by the work of Patashnik (2014), he expands the definition of policy change beyond conventional policy components. He argues that policies are not 'politically sustained' unless a fundamental transformation in 'actor preferences' takes place. They need to 'create new constituencies, new vested interests and rewrite what is and is not politically acceptable or irreversible, eventually reaching a point of no return'. Obviously, in 'techno-centric' subsystems, the main feature of 'policy preference' refers to the characteristics of preferred 'technological configuration' and socio-technical systems. Therefore, shift in technological system and physical infrastructure enhances the chance to 'lock-in' new policies into vested interests and preferences.

Although this paper has applied a technology-specific translation of this concept, it seems potentially generalisable and analytically meaningful even beyond techno-centric subsystems. This means, in a non-technologic policy subsystem, that an extreme change in governance, a so-called paradigmatic shift, not only includes change in paradigm, objectives, institutions and instruments, but also should represent a change in the preference of *how* that system would operate on the ground. Depending on the nature of those policy fields, the policy preference could involve features like the main solutions, strategies, system configuration and regime structure.

6. Summary and conclusions

From a theoretical perspective, in part, the present paper contributes to conceptual debates trying to bridge the gap between science and technology studies and public policy. With respect to the nature of the electricity system as a 'large technical system' or a 'techno-centric subsystem', this study illustrates that the current policy change literature is analytically incompetent to capture all characteristics of policy change in the electricity system. In particular, it points to the lack of a specific policy component to characterise changes in socio-materiality and technological features of the electricity system. By incorporating insights from Socio-Technical Transition literature, a fifth policy component, so-called technology preference, was conceptualised which aims at analysing changes in socio-technical characteristics of the electricity system. For the current UK electricity system, such characteristics include centralised design, large-scale technologies, supply-focused approach and an uncompetitive oligopoly structure.

It was also aimed to provide a set of contributions to the literature of policy change. Since providing an explanation of change dynamics is out of the analytical scope, it has mainly sought to contribute to theoretical debate about how one could characterise and measure

policy changes. By applying a developed framework in the UK electricity policy since the early 2000s, it is argued that even the most recent regulatory reforms manifested in EMR do not fulfil all characteristics of a wholesale paradigmatic shift in the power industry. This empirical finding contributes to and almost contrasts with recent debates about whether or not a paradigmatic shift has occurred in the UK energy and electricity policy (see Helm, 2005; Kern et al., 2014; Kern and Mitchell, 2010; Kuzemko, 2011; Mitchell, 2008). Such a conclusion, in itself, has wider international implications, given the leading role of the UK in developing a 'British model' of liberalised-marketised energy governance. It shows that despite a lot of alterations, the market legacy is still alive and its consequent socio-technical arrangements are yet almost resilient.

As a result, based on a comparison with the conceptual framework recently provided by Rogge and Reichardt (2016), two significant components found not to be addressed in the comparison base model, i.e. the component of policy paradigm and the sub-component of policy institutions (institutional changes) under policy processes component, which has overlaps with both policy making and policy implementation. Building upon the Kuhnian image of scientific paradigms, Hall (1993) conceptualises policy paradigm as the one shaping the key philosophy behind policymaking; framing the very problem that needs to be addressed; cognitively filtering information; and focusing attention on a particular range of solutions. Regarding policy institutions, it is argued that the structure of governance institutions allows or constrains a new policy paradigm's embeddedness, i.e. movement from one policy to another is likely to be preceded by significant shifts in the locus of authority over policy.

Without taking policy paradigm into account, a full conceptualization of the processes of UK electricity policy would not be possible. For example, analysis of the policy processes

of some interventionist policy instruments, like the Carbon Price Floor (CPF) and Contract for Difference (CfD) in post-2010 context, would not grant us a comprehensive understanding, as it should be without having the paradigm semi-shift from marketized depoliticization to large state intervention into consideration. Similarly, the institutional changes from the abolishment of the Department of Energy (DoE) and the creation of The Office of Gas and Electricity Markets (Ofgem) in 1990s to the revival of Department of Energy & Climate Change (DECC) and the establishment of The Committee on Climate Change (CCC) in 2008-2009 could explain why fundamentally different policy instruments, i.e. deregulation and regime-led instrument mixes, were adopted in those time-frames.

Nonetheless, in spite of important contributions from this study, it also reveals a series of analytical shortcomings and limitations in the applicability of the adopted framework. Firstly, the elasticity of the concept of measurement led to very imprecise and, occasionally, controversial conclusions. Secondly, the findings of this research display a much more complex interrelation between different policy components than the simple hierarchical one that was supposed in the framework. Finally, due to the contemporary nature of EMR, this study is unable to analyse it in a full policy cycle that would include implementation and outcomes.

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