

Policy change, power and the development of Great Britain's Renewable Heat Incentive

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Abstract

The role of socio-political power is central to the development of policy, but systematic analyses of power associated with the development of energy policy are rare. Power is also an important yet somewhat under-researched aspect of socio-technical transitions research. The Renewable Heat Incentive (RHI) policy aims to increase deployment of low-carbon heat in Great Britain and begin a transformation to a low carbon GB heat system. This article analyses the socio-political power associated with the development of the RHI policy based on Lukes' 'dimensions of power' approach using a methodology based on triangulation. We identify a number of policy change episodes during the development of the RHI and describe the influence of key actors on the policy. Despite the common assumption of the power of

incumbents, we show that those actors with niche technological expertise, close relationships with Government actors and actors within the administration have been the most powerful drivers of policy development and change. Niche actors sped up the introduction of the RHI scheme and have also had some success in increasing relative support for biomethane injection. The power of a civil servant to slow the introduction of the domestic element of the RHI has also been identified.

Highlights

- Socio-political power is seen as fundamental to energy policy and system transformations
- Power struggles have affected the development of the GB RHI policy
- Lukes' 3 dimensions of power have been recognised in the RHI's development
- Niche actors have been more influential in the RHI's early development than large incumbents
- Strengthening the UK 'Lobbying Act' could provide more visibility over UK lobbying

Keywords

Heat, policy, power, lobbying, socio-technical transition

Abbreviations

ASHP: Air source heat pump

BERR: Department for Business, Energy and Industrial Reform

DECC: Department of Energy and Climate Change

FIT: Feed In Tariff

GSHP: Ground source heat pump

NGO: Non-governmental organisation

REA: Renewable Energy Association

RHI: Renewable Heat Incentive

RHPP: Renewable Heat Premium Payment

1. Introduction

The UK heat sector has historically received limited attention from both policy makers and scholars. Recently, however, the focus on heat policy has increased.

The current reliance on fossil fuels for heat (shown in Figure 1) means that heat use accounts for a third of the UK's total GHG emissions (POST, 2016) and therefore current UK heating practices are incompatible with the UK's commitments under the Climate Change Act 2008 which requires the UK to reduce its GHG emissions by 80% compared to 1990 levels by 2050. The Act implies the transformation of the UK's national energy system, including electricity, transport, and heat. The Government, its independent statutory climate change advisor and others suggest that eliminating greenhouse gas emissions and the associated use of fossil fuels from space heating will be required if the UK is to meet its 2050 obligations (Carbon Connect, 2014; Committee on Climate Change, 2015; DECC, 2012a).

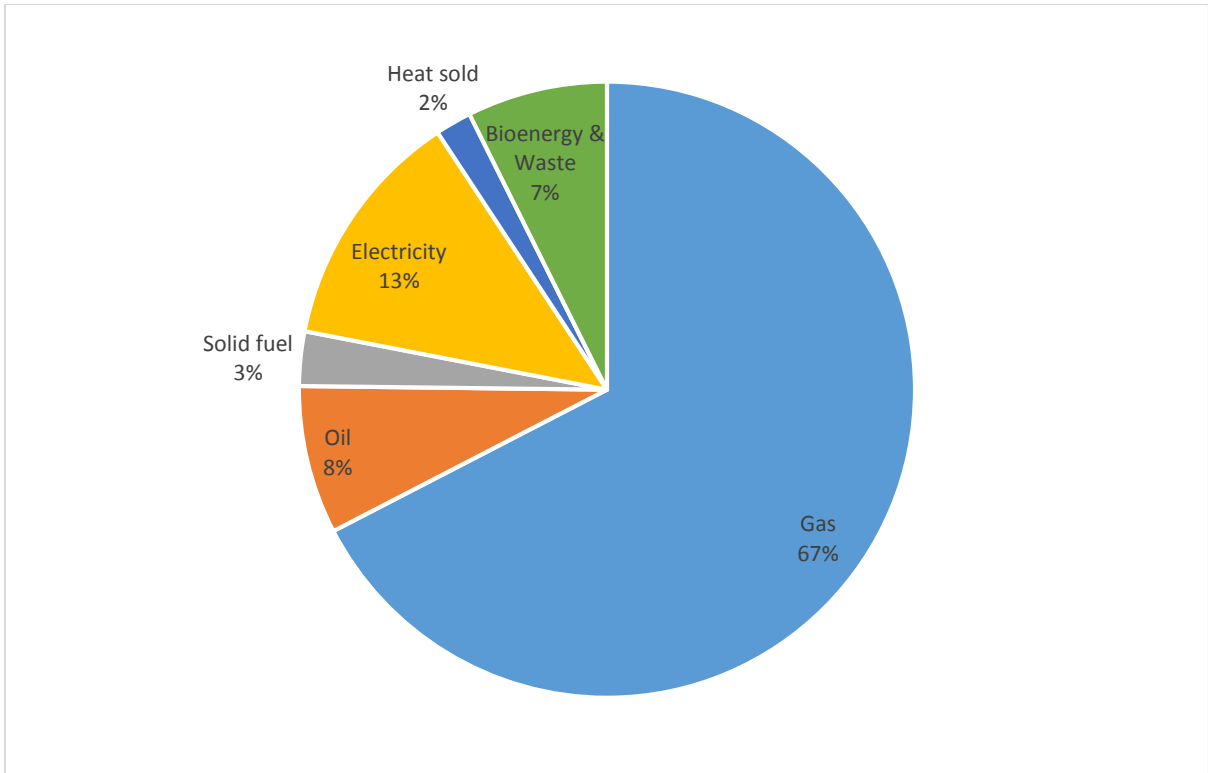


Figure 1. Fuels used for estimated UK heat use in 2017 (BEIS, 2018a)

The UK is also required to provide 15% of its energy from renewable sources by 2020 under the European Union’s Renewable Energy Directive (DECC, 2009). The UK Government anticipates that this will require around 12% of heat sourced from renewables by 2020 (HM Government, 2009), a major increase from the 2015 level of 5.6% (DECC, 2016).

Further still, the UK became a net importer of gas in 2000, and increasing import dependency means that around half of all gas is now imported (DECC, 2015a). Only very strong production growth of new sources of gas can reverse this trend (National Grid, 2016). Relying on natural gas imports also leaves the UK vulnerable to shifts in gas prices and its availability on the international market.

These factors have combined to increase the focus on the heat sector and the ways in which policy can encourage the adoption of low carbon heat technologies. In an attempt to drive this move, the UK Government introduced the Renewable Heat Incentive (RHI) in 2011. The

politics and socio-political power associated with the development of the RHI is the subject of this article.

Socio-political power has long been acknowledged as an important factor in the development of public policy (Hay, 2002; Kingdon, 2010; Sabatier, 1998; Weible et al., 2012). However, scholarly research concerning the transformation of large socio-technical systems has tended to overlook the importance of socio-political power (Meadowcroft, 2011, 2009, Shove and Walker, 2010, 2007).

In the UK context, specific concerns about lobbying and political transparency in the UK have been recently highlighted, with the introduction of the UK's 2014 'Lobbying Act' which had the aim of making UK politics 'more transparent' and for the first time registering lobbyists (HM Government, 2012, p3).

This article explores the role of socio-political power in the creation and early development of the Great Britain¹ (GB) RHI policy between 2008 and 2014. It considers the interaction and power-relations of businesses, trade associations, non-governmental organisations (NGOs) and civil servants and examines the influence of these actors on the development of the policy by considering three research questions:

1. How has the RHI been affected by socio-political power?
2. How have actors attempted to influence the RHI?
3. What are the implications of this influence for the GB transformation to low-carbon heating?

This research contributes to the literature on lobbying and its influence on energy policy as well as that addressing socio-technical transitions.

¹ Great Britain includes England, Scotland and Wales but not Northern Ireland. Energy Policy for Northern Ireland is a fully devolved matter and is not part of the central UK Government portfolio although the Climate Change Act Extends to Northern Ireland (HM Government, 2008)

The article is structured as follows: section 2 describes the introduction of the RHI scheme, in section 3 we set out how we conceptualise power in the context of socio-technical transitions and energy policy. In section 4, we describe the methodology. In section 5, we present our analysis. In section 6, we discuss our results our key theoretical and methodological contributions, finally, we state our conclusions and the implications for policy in section 7.

2. The RHI and performance to date

This section briefly describes the history and design of the RHI and evaluates its performance (for a more detailed review see Connor et al., (2015)).

The introduction of the RHI is the first significant change to heat policy in the UK since the mandating of condensing boilers in 2003 (Department for Trade and Industry, 2003). The 'Clear Skies' programme (2003 – 2006) and 'Low-carbon Buildings Programme' (2006 – 2010) delivered some renewable heat capacity such as biomass and solar thermal through grant payments (Connor et al., 2015). However, these schemes were small-scale and short-term and did not explicitly target renewable heat deployment.

In 2008, the UK Government proposed several options for renewable heat support (BERR, 2008a). These included an obligation for renewable heat or a tariff-based incentive mechanism (BERR, 2008b). At the end of 2008 the legislation for a tariff-based incentive mechanism to support renewable heat which came to be known as the RHI was introduced alongside legislation for the Feed In Tariff (FIT) which supported small scale renewable electricity generation (Parliament, 2008a).

Following the 2010 general election, there were uncertainties over how the RHI would be funded but in October that year it was announced that funding would be made available to for the RHI (HM Treasury, 2010).

The RHI opened for non-domestic applications in November 2011. The non-domestic RHI policy provides qualifying new renewable heat installations with a fixed payment per unit of energy for 20 years (DECC, 2011a). The initial non-domestic tariffs are shown in Table 1.

Tariff name	Eligible technology	Eligible sizes	Tariff rate (pence/kWh)
Small biomass	Solid biomass; Municipal	Less than 200 kWth	Tier 1: 7.6 Tier 2: 1.9
Medium biomass	Solid Waste (incl. CHP)	200 kWth and above; less than 1,000 kWth	Tier 1: 4.7 Tier 2: 1.9
Large biomass		1,000 kWth and above	2.6
Small ground source	Ground-source heat pumps;	Less than 100 kWth	4.3
Large ground source	Water-source heat pumps; deep geothermal	100 kWth and above	3
Solar thermal	Solar thermal	Less than 200 kWth	8.5

Biomethane	Biomethane injection and biogas combustion, except from landfill gas	Biomethane all scales, biogas combustion less than 200 kWth	6.5
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Table 1. Non-domestic RHI tariffs at the time of scheme introduction in November 2011 (DECC, 2011a)

The implementation of the domestic RHI scheme was delayed (further details of this delay are considered in section 5.3) and in 2011 an interim policy called the Renewable Heat Premium Payment' (RHPP) was introduced. THE RHPP provided capital grants for air source and ground source heat pumps, solar thermal systems and biomass boilers and was taken up by around 15,000 households (DECC, 2014a). The domestic RHI eventually opened in Spring 2014 and rewards homeowners who generate renewable heat with a fixed tariff for seven years (DECC, 2013a). Technologies supported by the RHI include biomass boilers, heat pumps, solar thermal and biogas. The tariffs at the time of the scheme's introduction are shown in Table 2 (section 5.4) where they form an important aspect of one of the policy episodes.

There has been very limited academic discussion or analysis of the RHI. The work which exists has evaluated the expected deployment of solar thermal technologies in advance of the scheme (Abu-Bakar et al., 2014, 2013) and has also used agent based modelling to consider heat pump uptake (Snape et al., 2015). In both cases, it was suggested higher tariffs were needed to drive technology deployment.

As shown in Figure 2, accreditations for biomass heating systems have dominated the non-domestic RHI every quarter since it opened. The original Government impact assessment for

the policy suggested that heat from biomass was expected to contribute to around 49% of heat supported by the RHI (DECC, 2011b). However many more biomass boilers have been delivered than was initially suggested in the RHI impact assessment (DECC, 2011b). Over the course on the non-domestic RHI, 76% of the total heat delivered by the scheme has been delivered through biomass combustion (based on BEIS, (2017b) statistics).

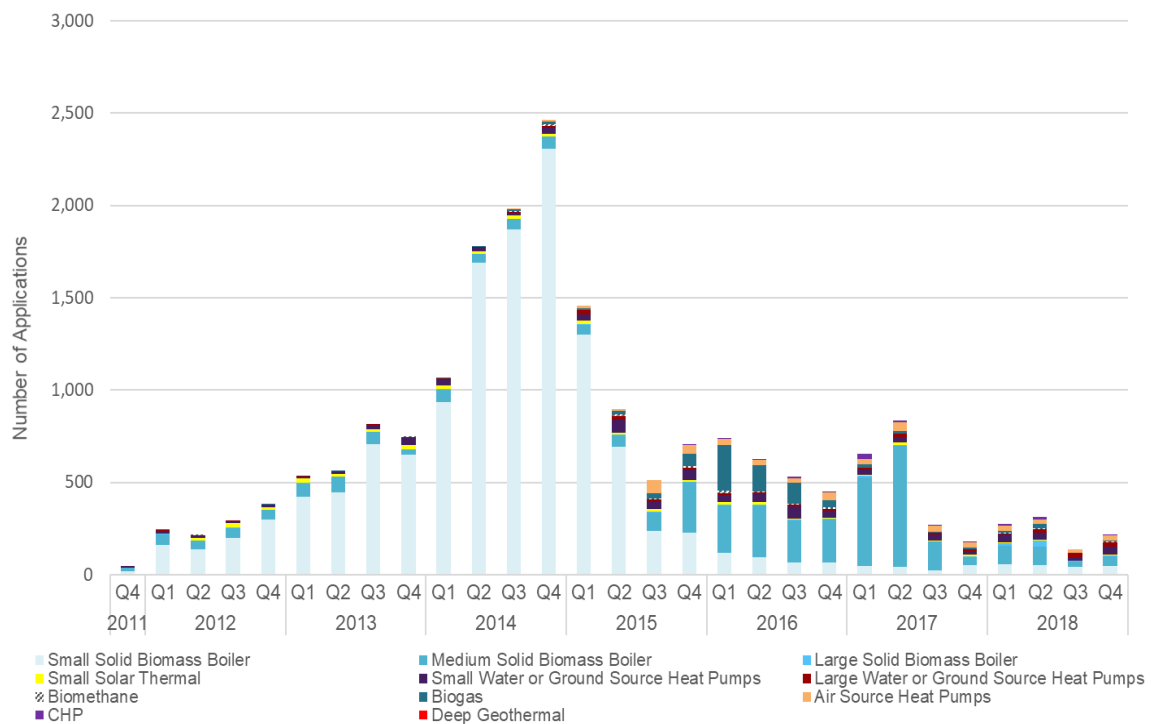


Figure 2. Quarterly number of applications split by technology under the non-domestic RHI scheme (BEIS, 2018b)

Figure 2 also includes biomethane site accreditations under the RHI but because of the relatively large scale and small number of these sites, the growth of biomethane is not shown clearly. Similar to biomass, biomethane has also contributed to a significant proportion of the RHI’s total renewable heat deployment. By December 2018, biomethane accounted for over 22% of the heat delivered by the scheme (BEIS, 2018b) which compares to the 7% suggested as likely uptake in the early government impact assessment (DECC, 2011b).

Figure 3 shows the monthly number of accreditations for new installations under the domestic RHI. For every month of the first year of the scheme, by far the largest number of new installations were biomass boilers. However, the impact assessment produced by the Government in advance of the domestic RHI scheme suggested that just 9% of expected installations under the RHI would be biomass boilers, whereas the largest proportion (46% would be for ASHPs, 25% for solar thermal and 20% for GSHPs (DECC, 2013b). In light of tariff reductions for domestic biomass systems throughout 2015, deployment levels of biomass boilers have reduced significantly since then and air source heat pumps are now the most popular technology under the scheme.

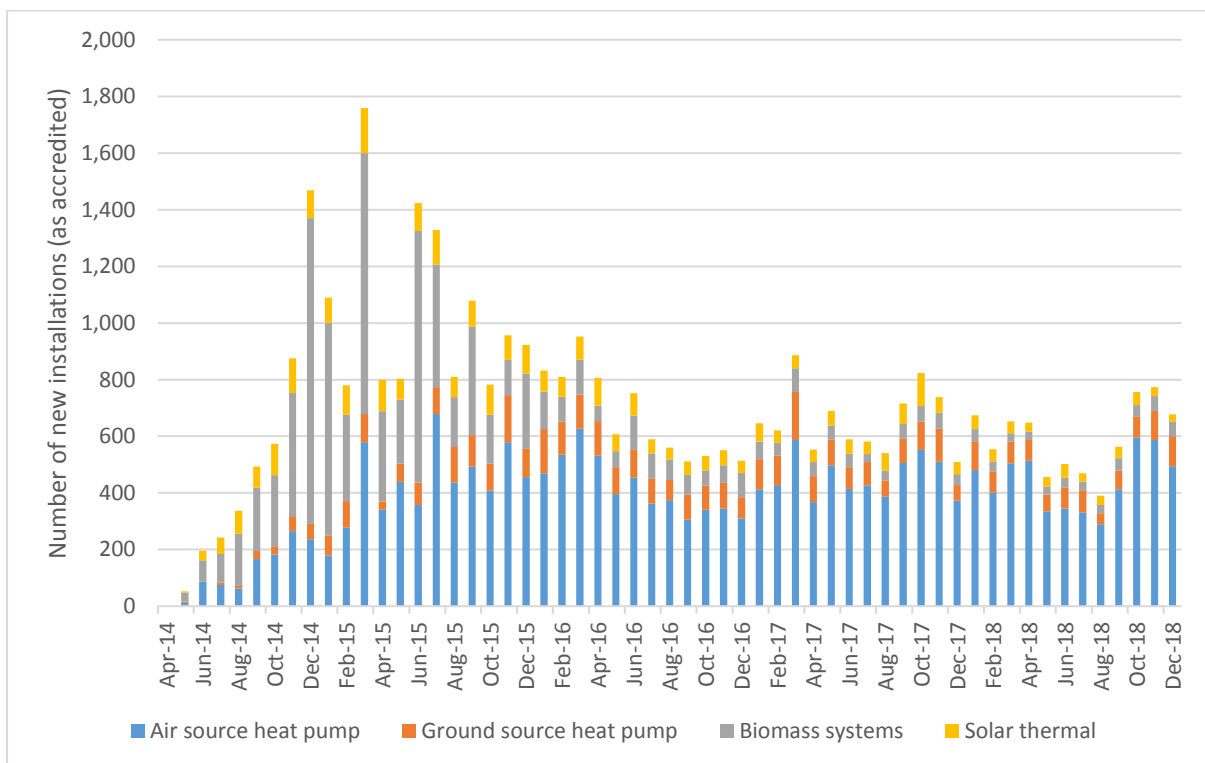


Figure 3. Monthly number of installations (accreditations) split by technology under the domestic RHI scheme showing new installations only.² Based on BEIS, (2017b) and (BEIS, 2018b) statistics.

² Legacy installations which received RHPP grants (installed before April 2014) and then later registered for the RHI have not been included. Due to data errors, 3 data points for 2014 have been removed but this has had no visual effect on the graph.

There have been a number of policy changes to the non-domestic and domestic RHI scheme since their introduction, including:

- The introduction of tariff degression for managing the RHI budget 2013 (DECC, 2013c)
- The addition of new technologies and tariff changes for the non-domestic scheme in 2013 (DECC, 2013d)
- A full review of the biomethane tariff in 2014 (DECC, 2014b)
- The introduction of 'sustainability criteria' for biomass based heat systems in 2015 (DECC, 2015b)
- A review of all tariffs, a simplification of tariff structures and the introduction of heat consumption limits in 2016 (BEIS, 2016)

We do not set out to evaluate the performance of the RHI. Instead, we investigate the role of actors and politics in driving the development of the RHI and policy change up to mid-2015.

3. Power, policy and socio-technical transitions

This section discusses conceptual approaches to the study of power, its implications for socio-technical transitions and the role of actor based power on shaping energy policy.

3.1. Conceptualising power

The concept of power is one of the most contested ideas in the social and political sciences (Arts, 2000). Lukes explains that '*there is no agreement about how to define it, how to conceive it, how to study it and, if it can be measured, how to measure it [power]*' (Lukes, 2005, p. 61). Consequently, studying power is inherently challenging.

Normative understandings of the idea of 'power' are widespread. Political actors are often described as being powerful or 'having power' and therefore in possession of the ability to influence the policy process. The study of politics is, in many ways, the study of power (Neumann, 1950).

During the 20th century, various theorists considered what power is and how it works. For example, Max Weber famously defined power as *'the opportunity to impose one's will in a social relationship, even against resistance, without consideration to what this opportunity rests on'* (Weber, 1922). Later, Robert Dahl stated that *'A has power over B to the extent that he can get B to do something that B would not otherwise do'* (Dahl, 1957, p. 202).

In an attempt to synthesise and consolidate disparate understandings of power, and allow the concept of power to be applied, Lukes developed a conceptual model which comprises three 'dimensions' of power (Lukes, 2005). In this framework:

- The first dimension is the ability of the powerful to coerce another actor to do something that they would not otherwise have done
- The second dimension is the ability of the powerful to mobilise bias by controlling what is discussed or setting the agenda
- Lukes' third dimension of power is conceived as being the powerful's ability to affect others' thoughts or preferences controlling *'their perceptions, cognitions and preferences in such a way that they accept their role in the existing order of things, either because they can see or imagine no alternative to it, or because they see it as natural and unchangeable, or because they value it as divinely ordained and beneficial'* (Lukes, 2005, p28).

Extending this framework, some authors have suggested that social and political power has four dimensions. This approach effectively augments Luke's three dimensions with a 'fourth dimension', drawing on Michel Foucault's conceptualisation of power centred on the institutionalisation of behaviour and the role of knowledge production (Digeser, 1992; Haugaard, 2012; Haugaard and Ryan, 2012).

Foucault provides no straightforward means of operationalising this approach to power (Kendall and Wickham, 1999) but the fourth dimension or 'Foucauldian' approach places production of knowledge and the replication of social structures as central aspects (Mills,

2003, Reed, 2013). Applying Foucault's approaches to power to empirical studies is therefore particularly complex (although attempts have been made e.g Froud et al., (2017)).

The subtlety of Foucault's work means that in this article we, like others before us (e.g. Arts and Tatenhove, 2005) focus instead on the more purposive manifestations of power, employing the three dimensions of power put forward by Lukes (2005) to consider various actors' roles in the development of the RHI. We investigate whether and how actors have been able to influence the development of the policy.

3.2. The power of actors and socio-technical transitions

The rapidly growing literature associated with the transformation of large socio-technical systems takes as its unit of analysis the transition itself, but does recognise the importance of socio-political power. This section summaries the treatment of power in transition studies.

Transitions research highlights the importance of actors' agency (Shove and Walker, 2007; Smith et al., 2005). In particular, the expectation that incumbents and existing regime actors to influence and shape systemic change in their own interests transitions is well documented (Avelino and Wittmayer, 2016; Geels, 2014, 2011; Grin, 2010; Hess, 2014; Kemp et al., 2007; Meadowcroft, 2009; Pel, 2015; Smith et al., 2005).

Small or niche actors have been seen to have the ability to influence over system change (Späth and Rohracher, 2010) but their lack of material, political and informational resources may limit their power (Avelino, 2009; Kenis et al., 2016). The importance of language, visions and ideas as well as legitimacy and leadership are also growing in recognition (Grin, 2010; Meadowcroft, 2009; Smith and Stirling, 2007; Späth and Rohracher, 2010; Walker and Shove, 2007).

Despite the acknowledged importance of the power, there has been limited research into the actual role of power in transitions. Existing work tends to focus explicitly on the role of institutions (Fuenfschilling and Truffer, 2014; Späth and Rohracher, 2010), incumbents (Kern

and Smith, 2008), path dependency, history, and paradigm change (Arapostathis et al., 2013; Castán Broto, 2015; Lockwood et al., 2017), or the proponents of particular technological solutions (Raven et al., 2016). The focus of much of this work, however, tends to observe the macro-level implications of power, alongside other factors, on transitions rather than detailed, micro-level observation of power in practice.

By focusing on specific policy change, this article contributes to the understanding of power in policy development and change at the micro-level. Its focus on power and public policy and the application of the three dimensions of power approach builds on specific previous calls for transitions research, including a focus on how actors can affect technology diffusion (Genus and Coles, 2008), a greater focus on power and public policy (Smith et al., 2010), a focus on ideas, interests and institutions (Meadowcroft, 2011), as well as the application of more general power theories such as the three dimensions of power approach (Geels, 2010).

3.3. The power of actors and energy policy

The socio-technical transitions literature highlights the importance of politics and policy in determining transition trajectories (Hendriks, 2009; Kuzemko, 2013; Meadowcroft, 2011, 2009; Raven et al., 2016). At the same time, power is central to politics and therefore policy (Hay, 2002). Of particular importance to studies of how policy is made is the so-called 'lobbying' activity of 'outside' actors with little or no formal role in the process, such as interest groups (Kingdon, 2010).

Interest group scholars researching lobbying activity often tend to seek to understand the strategies employed by these particular political actors and their success factors. Key concepts in the study of lobbying and other interest group activity include agenda-setting, advocacy coalitions, framing, issue salience, and problem definition (Baumgartner et al., 2009; Baumgartner and Jones, 2015; Kingdon, 2010; Sabatier and Jenkins-Smith, 1999). In this article, however, we propose that revisiting the 'dimensions of power' can provide a

unique insight into the relationship between lobbying, policy outcomes and their relationships with socio-technical transitions. As well as responding to previous calls to use the 'dimensions of power' to consider socio-technical transitions, we believe this approach also allows a wider understanding of power that goes beyond lobbying.

There is a body of case studies describing lobbying on a wide array of policy topics, but relatively few of these studies focus purely on the energy policymaking process. Many of the notable contributions concern EU energy policy processes (Boasson and Wettestad, 2013; Fitch-Roy et al., 2019a, 2019b, Gullberg, 2015, 2013, 2008; Toke, 2008; Ydersbond, 2018). The limitations of case-study research methods for creating generalizable knowledge has recently led the discipline towards the use of 'large-n' population studies in which quantitative techniques such as text analysis are used to analyse many instances of lobbying, across policy areas and contexts (e.g. Boräng et al., 2014; Bunea and Baumgartner, 2014; Gray and Lowery, 1996; Klüver, 2013). While this approach offers researchers the ability to control for contextual factors to create generic understanding, it does not allow the thick description required to explain a particular outcome – and its implications for phenomena such as socio-technical transition - in detail.

Despite the established importance of lobbying, we are unaware of research that specifically investigates UK lobbying associated with energy. This article contributes to the literature on energy policy lobbying and provides an original focus on the role of lobbying on UK energy policy development.

4. Methodological approach

Attributing the agency of actors to cause policy change is complex due to the various factors and actors at play in the policy process (John, 2012). There are three basic types of methodological approaches for measuring the impact of actor lobbying on policy change, these are: measured preference attainment, process tracing, and assessing attributed influence (Dür, 2008).

Here we employ an instrument combining the two latter approaches. In order to investigate policy changes associated with the RHI, we make use of the 'EAR' instrument. This technique considers and triangulates three perspectives associated with specific policy changes overcoming some of the limits of relying on preference attainment and attribution based methods (Arts and Verschuren, 1999). Firstly, it considers the views of the lobbyists, key players who are involved with or have knowledge of the influencing associated with the relevant policy ('ego' or E). Secondly the views of relevant politicians or civil servants with a knowledge of the specific policy development are considered ('alter' or A). The approach also considers the view of the researcher (R) on the particular policy change based on desk based research (Arts and Verschuren, 1999). The triangulation process then compares the views of the egos, alters and the researcher to see where views agree or diverge. Agreement among the three perspectives is taken as evidence that a policy change has taken place and gives an indication of whether or not power, influence or lobbying has caused the observed change. A diagrammatic representation of the EAR instrument is shown in Figure 4.

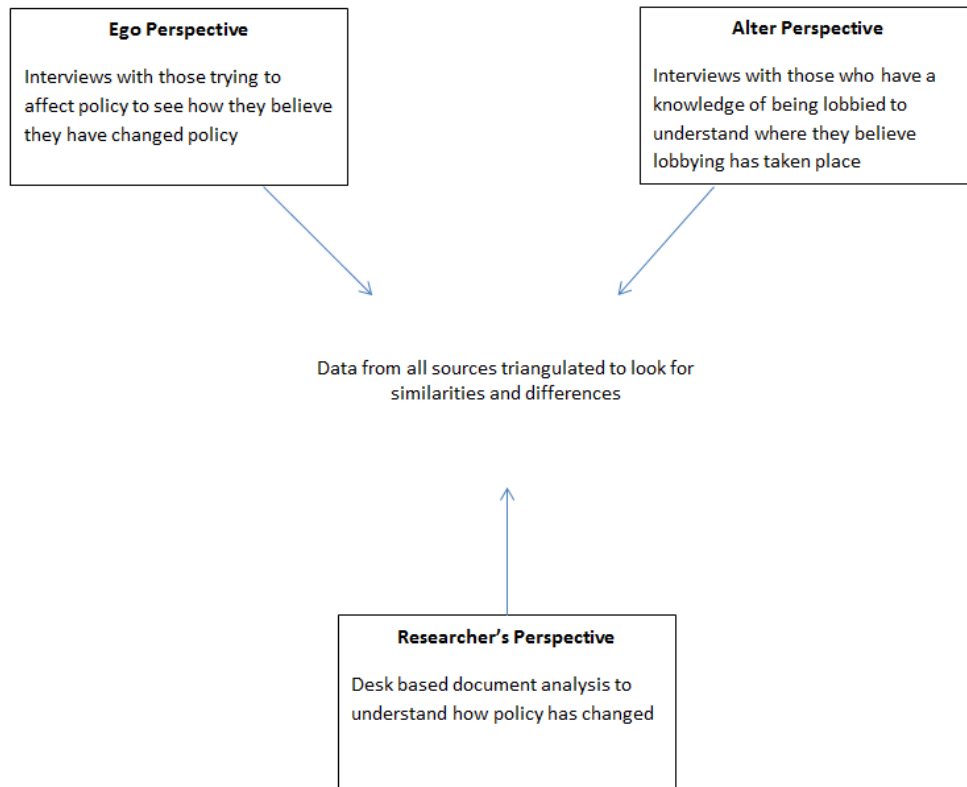


Figure 4. The triangulation process for the analysis of lobbying based on the EAR instrument (Arts and Verschuren, 1999)

The use of the triangulation approach and the EAR instrument requires relying on the view of those being lobbied, such as the civil servants and politicians, in order to corroborate the views of lobbyists. But it may be the case that none of the interviewees are entirely forthcoming or that their reports are not entirely objective, over- or under-stating their own or others' influence, either intentionally or unintentionally (Beyers et al., 2014). While thorough, the requirement of the EAR instrument for interviews with relevant 'egos', specific 'alters' and access to relevant policy literature also increases complexity of analysis and deliverability of results under the methodology (Arts and Verschuren, 1999).

The importance of timing and the sequential order of events for the ability of actors to influence policy is sometimes captured by the concept of 'policy windows', particular moments in time when conditions are conducive to policy change (Kingdon, 2010). The

designers of the 'EAR' instrument also emphasize the importance the wider policy context (Arts and Verschuren, 1999). The development of energy policy is recognised as being particularly temporally contingent and contextual, linked to relevant institutions and circumstances (Kuzemko et al., 2016). Others have also argued that the position of actors in relation to other actors can also be another important contextual factor (Geels, 2014). Process tracing allows particular attention to be paid to the order of events relative to significant contextual changes. The analysis of the RHI policy changes, while focusing on the role of actors will therefore also consider how these contextual and structural factors have affected the RHI's development.

The empirical data for this study is drawn from contemporary documentary evidence and a series of 15 interviews carried out in 2015 with policymakers and other stakeholders. Policy change 'episodes' are only included in the results of interviewees have highlighted that the power of actors has been vital in causing policy change and the actual policy change is apparent in grey literature. The EAR instrument is then used to investigate power in each of these episodes.

5. Results: Power and the Renewable Heat Incentive

This section charts the development of the RHI through a series of policy episodes. Results cite documentary evidence (author and year) or interviews (numerical references). A list of interviewees is provided in appendix A. Some interviews are anonymous and referenced as such.

We describe a number of key episodes in the development and implementation of the RHI which were identified by interviewees as having power as important to them. Each episode is considered in relation to the dimensions of power framework.

Figure 5 shows a timeline of the policy episodes alongside other key policy and political events. The following sub-sections chronologically consider all of the significant episodes of

policy change in the development of the RHI between its inception and introduction in 2008 up to 2015.

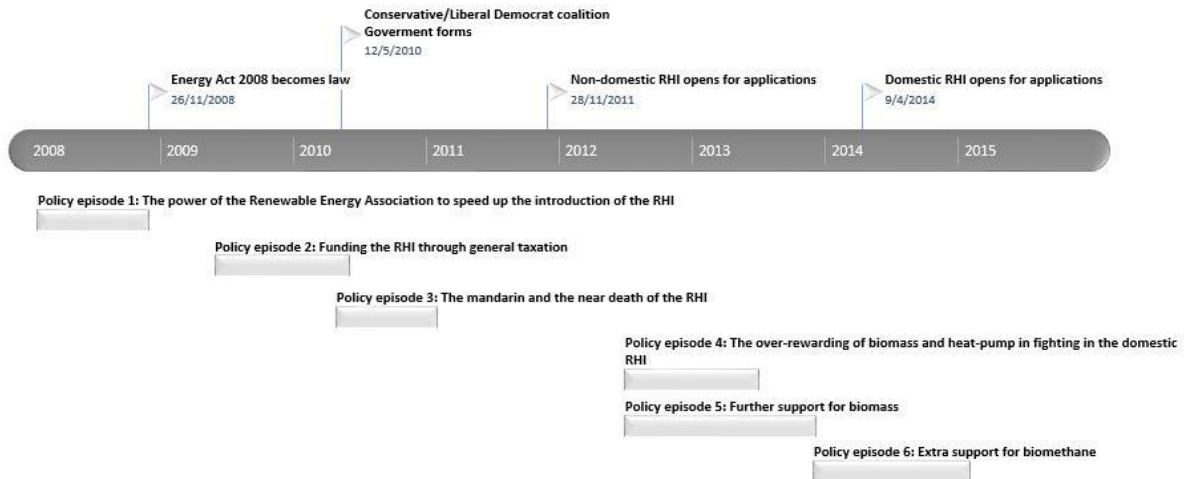


Figure 5. RHI policy episode timeline with key policy developments. Timing of policy episodes cannot be taken to be exact due to their complex nature.

5.1. Policy episode 1: The power of the Renewable Energy Association to speed up the introduction of the RHI

Preliminary discussions within Government about renewable heat took place around the same time that a new Energy Bill, focussed on renewable electricity policies, was being scrutinised. Parliamentarians and wider civil society supported the introduction of a Feed-In Tariff (FIT) to promote small renewable electricity projects, something that was absent from the draft Bill. This support was officially set down in an Early Day Motion (a parliamentary tool designed to encourage debate) tabled on the 5th February 2008 which had the support of 281 out of 650 MPs (Parliament, 2008b).

In April 2008, Alan Simpson, the member of Parliament who laid the Early Day Motion, along with a number of other MPs laid a potential amendment to what would become the Energy Act 2008. This amendment would have caused the Government to introduce a FIT system

which would have supported small scale electricity and heat. This amendment was only narrowly defeated in a Commons vote (representing a significant government rebellion) demonstrating an unexpected level of support for small-scale renewable energy (Guardian, 2008; Parliament, 2008b).

The Government was concerned that political support for the FIT policy would eventually lead to a defeat in the Commons and took the opportunity to amend the Bill, creating the electricity FIT and laying the primary legislation for a Renewable Heat Incentive (1). In the words of one interviewee, Parliament '*forced the Government's hand*' to create the legislation for the RHI (2).

Although the government introduced the amendment, the political impetus for the RHI came from Parliament. However, the Renewable Energy Association (REA), a trade body representing renewable energy companies, explained that they believed that they, along with Friends of the Earth, a non-governmental organisation, had been '*instrumental*' in getting the amendment to the Bill (3) and this was also repeated by other former employees (4, 5) including their former chief executive, who claimed that:

'the whole of that Feed In Tariff and the RHI existence was the big win. That was the first big goal.' (4)

Another interviewee explained that a '*Feed In Tariff campaign*' had been led by non-governmental association Friends of the Earth and involved the Renewable Energy Association, which was particularly keen that the amendment included heat; this campaign had the support of Alan Simpson MP (1).

Sources agree about the role of the REA in influencing the inclusion of heat in the Energy Bill. Two civil servants working on the RHI believed that the REA played the leading role in campaigning for the RHI (1, 6). One civil servant explained that '*the REA drove the amendment and everyone coalesced behind the REA*' (1). Another civil servant explained:

'they were a big force certainly, even just to get the legislation in so she (chief executive of REA) was a big force and I think probably on Feed In Tariffs as well so I thinkthe REA were the biggest sort of influence' (6).

While interviewees agree that the REA alongside Friends of the Earth had played an important role, one source suggests that although the campaign supported the RHI's development, the RHI would probably have happened anyway, it simply happened sooner (5). Indeed, a civil servant stated that *'we thought this is a fantastic opportunity to get some primary legislation in around a renewable heat incentive'* (1). It is true that the Government was already discussing support for renewable heat. This implies that while the REA's push for the amendment was successful, it simply sped up the process, highlighting the importance of timing and context in this particular policy episode.

This episode demonstrates the action of the first dimension of power. The REA appears to have induced the Government to do something that they would not have otherwise done on the same timescale. It also suggests the second dimension of power, the ability of parliamentarians to put renewable heat on the agenda at an opportune moment. The third dimension of power, the shaping of preferences can also be observed, with the role of a *'Feed-In Tariff campaign'* to cause MPs to change their preferences and support change and amendment to the Energy Act 2008.

5.2. Policy episode 2: Funding the RHI through general taxation

In its 'Renewable Energy Strategy' white paper, the Government initially suggested that the RHI would be funded through a levy on fossil fuels, in much the same way that UK renewable electricity levies are placed on electricity bills (HM Government, 2009). However, in 2010, following informal consultation with industry, the Government announced that it was considering changing how it planned to fund the scheme (DECC, 2010). It explained that the Government had met with organisations that, if there were a levy on fossil fuels, would be liable for the cost of the RHI. These problems included equitability concerns around who

would pay for the scheme, the transparency of scheme costs and the complexity associated with administering it (DECC, 2010). There were questions about which fossil fuels would be subject to the levy, with concerns raised about barbecue gas canisters and bags of coal (1). There was also recognition that only placing the levy on natural gas would penalise one of the lowest carbon sources of heat available. However, precisely why change came about is not clear.

One off-grid fossil fuel company explained that:

'We lobbied very hard that the RHI should come from general taxation, not from a levy on fuel bills and it came from general taxation, how much we had to do with that I don't know, but that was certainly our line' (8).

Large energy companies were also unhappy with the levy idea. A civil servant in DECC, explained that while the major energy companies were generally supportive of the RHI:

'...off the record they would say we might stomach it [funding through a levy on bills] for a while but eventually we will not, we will challenge you because it just doesn't make sense that we get a levy on us' (6).

The fact that the RHI was funded through general taxation reflects the preferences of the companies that sell fossil fuels both on and off the gas grid. However, the use of triangulation does not suggest the fossil fuel companies necessarily influenced the outcome and there is no suggestion that on gas grid and off gas grid companies worked together to attempt to reach this outcome. While, according to a former DECC civil servant, lobbying from the fossil fuel sector was felt by DECC on the issue, the government was concerned that funding the RHI through energy suppliers would have been complex and long-winded, and that funding it through taxation was simpler (1). This highlights an important contextual administrative factor that may have driven the policy to be funded through taxation.

Despite a recognition of the role of power in this example by interviewees, determining the

role of power in this example is difficult. Interview data between Egos (lobbyists) and Alters (actor being lobbied) cannot be corroborated and the limited grey literature on the issue doesn't give any further detail (DECC, 2010). Uncorroborated civil servant (alter) reports are treated with caution because civil servants may not wish to appear as if other actors have successfully persuaded them to change their policy position.

It is not clear what role power dynamics played in this episode. Fossil fuel companies did, however, attempt to influence the Government's position on the funding model, consistent with the first dimension of power.

5.3. Policy episode 3: The mandarin and the near death of the RHI

Despite political and industry support, the existence of the required laws and finances being available, one major obstacle to the RHI remained, the most senior civil servant at the Department of Energy and Climate Change. The 'Permanent Secretary' in DECC is both the head of the department and 'Accounting Officer', accountable to Parliament for spending (HM Treasury, 2015).

At the time of the introduction of the RHI, DECC's 'Permanent Secretary' and 'Accounting Officer' was, according to two separate DECC sources (both anonymous), personally opposed it. The most negative comments regarding the RHI came from within DECC following an unexpectedly rapid take-up of solar photovoltaic panels. The concern was that overspend on the Feed-In Tariffs for electricity, an embarrassment for the department, would be replicated in heat policy (1, 6, 9). The RHI policy was also recognised as being both a large item of spend in general and an expensive way of reducing carbon emissions. One civil servant explained:

'it was designed purely to meet that 2020 [EU Renewable Energy] target. If you were looking at something purely on low-carbon terms you probably wouldn't have done it like that, in fact we wouldn't have done it like that and it was hugely expensive, we

knew that' (anonymous).

At one point, the civil service considered relinquishing budgetary responsibility (9). However, the request for a 'ministerial direction'³ was never issued (9) and in February 2011, Chris Huhne pushed through the non-domestic RHI, specifically excluding domestic scale systems, which the policy impact assessment had deemed to offer poor value for money (anonymous). As a compromise, the RHPP scheme was introduced which offered limited capital grants for domestic renewable heat systems in advance of a potential domestic RHI.

This episode concerns administrative power dynamics rather than the role of external interests but represents an important power struggle in the development of the RHI. In this case, the 'ego' is the Permanent Secretary, attempting (apparently successfully) to stop or slow the RHI policy while the 'alters' are the department's own ministers. Full triangulation in this case is not possible because of a lack of documentary evidence associated with this internal Government power struggle and because relevant 'ego' and 'alter' interviewees have not been available for interviews; this highlights a known issue with the EAR instrument. However, it appears, based on interviews with two separate civil servants that the permanent secretary did exercise power in reducing the scale of the RHI by excluding domestic installations.

The permanent secretary deployed the first dimension of power to force ministers to modify the RHI. However, although the permanent secretary was able to have power, this was down to the formal authority of her role; she was both in charge of the department and held responsibility for all DECC departmental spending. While we can ascribe this policy change to the first dimension of power, it is important to recognise the significance of the institutional context. The department's experience of unplanned cost escalation in the electricity Feed-In

³ A ministerial direction requested by a permanent secretary passes financial accountability for a Government decision onto the relevant minister (HM Treasury, 2015). Two ministerial directions were requested between 2010 and 2015, making them an uncommon occurrence (Institute for Government, 2015).

Tariff policy may also have increased the focus on cost effectiveness of the RHI, highlighting the timing of this policy episode relative to other policy developments.

5.4. Policy episode 4: The over-rewarding of biomass and heat pump in-fighting in the domestic RHI

In 2013, DECC released details of the domestic RHI, to be launched in spring 2014. The scheme would support biomass systems, air-source heat-pumps (ASHP), ground and water-source heat pumps (GSHP) and solar thermal with 7 year tariffs (DECC, 2013a).

As shown in Table 2, the domestic tariffs differed from those proposed in the original consultation document. The changes, according to Government, reflected cost information gathered from the Renewable Heat Premium Payment grant, an existing policy, and new research. The air-source heat pump tariff was lower than expected while the biomass and solar thermal tariffs were higher (DECC, 2013a).

	Biomass	ASHP	GSHP	Solar Thermal
Tariff range proposed at consultation stage in 2012 (DECC, 2012b) (payable on total heat output) (pence/kWh)	5.2-8.7	6.9-11.5	12.5-17.3	17.3
Initial tariffs for scheme released in 2013 (pence/kWh) (equivalent to tariff payable on total heat output for	12.2	4.7	13.2	19.2

comparison to row above)				
Actual initial tariffs (pence/kWh)	12.2	7.3	18.8	19.2

Table 2. Tariffs for technologies under the domestic RHI at 2012 consultation and then after the consultation at the introduction of the scheme (DECC, 2013b) N.B. for comparisons between the final and proposed tariffs, use the numbers in bold; these figures represent the tariff paid on total heat output as opposed to actual tariffs which are paid only on the ‘renewable’ proportion of heat (for heat pumps)

According to one interviewee from a ground source heat pump (GSHP) manufacturer:

‘the Micro-Power Council (a trade association) were very, very supportive of air-source [heat pumps] and were very cross with me when we argued to DECC that this is a technology that could take off and you’ve got to be careful about the tariff. And we knew we were on very fertile ground here, DECC were so worried about budget that anyone saying the air-source industry could explode, it could be cheap Chinese kit DECC were going “oh we can’t have this, this is dreadful scenario” and they slashed the tariff’ (10).

The government’s sensitivity to the risk of unanticipated cost escalation based on recent experience of the Feed-In Tariff created a concern that too high a tariff might trigger an expensive boom in heat pump deployment. At least one trade association raised concerns about the quality and performance of air source heat pumps, suggesting that the RHI may over-reward them (5).

The lower air source heat pump tariff was seen as a success by some (3, 10), particularly ground-source heat pump advocates, who claimed a small victory (10) and believed they influenced policy in a way which could be seen as the first face of power. However, the success was qualified by a GSHP tariff set near the bottom of the proposed band. The biomass tariff was also significantly higher than had been expected by industry (see table 2).

'It was a policy success, but hurting them and not helping yourselves [GSHP] was a fairly disappointing outcome' (10, GSHP manufacturer).

According to the DECC impact assessment (DECC, 2013b), the tariff changes were based on evidence gathered through the Renewable Heat Premium Payment grant research by management consultants 'sweett Group' (sweett, 2013). There was no evidence that the biomass tariff changed due to industry lobbying. The impact assessment stated:

'There are some significant changes which have been made to the tariffs most notably for net capital cost (Biomass is more expensive than previous evidence suggested, ASHPs are slightly cheaper) and load factors [level of use]...' (DECC, 2013b).

The costs information contained in the 'sweett Group' report was based on responses to questionnaires completed by industry participants such as installers (sweett, 2013). This reliance on industry data is an example of the power that industry actors can have when policymakers source information from actors with an interest in the policy outcome.

Information can be provided in support of the preferences of provider. Nevertheless, despite the tariff changes, it is not possible to attribute changes to the action of specific actors with the EAR instrument in this case since there is no evidence from alters i.e. civil servants, that anyone successfully influenced the tariffs. In fact, one DECC civil servant suggests that in the case of biomass:

'they have been treated very generously by DECC with absurdly large subsidies for biomass boilers which have been flooding in to dubious locations all around the country for many years now so I didn't see much lobbying from them because yeah they were just getting fat on the subsidies and didn't need to lobby me' (11).

Despite observable attempts to influence tariffs, there is no clear evidence that any actors successfully did so. It is possible that the industry was able, through strategically providing

cost information to the consultants, able to influence tariffs indirectly. The provision of evidence could be seen as the first dimension of power if as a result its deployment is causes policy makers to change. Evidence could also be seen to be associated with the second dimension if it puts ideas on the agenda or the third dimension if it shapes preferences or views.

Interestingly, this episode shows that, even within the low-carbon heat industry, power rivalries exist. In this case, it appears that conflict between advocates of rival heating technologies may have led to a net reduction in the overall financial support for the sector.

5.5. Policy episode 5: Further support for biomass

In 2013, a change was introduced that significantly increased the budget available to small and medium scale non-domestic biomass boilers causing tariff levels to remain higher than they otherwise would have been (DECC, 2013d).

The renewable energy industry and the government were engaged in '*quite a big feed-back loop*' (12), according to one civil servant at DECC, and the REA took credit for influencing this budget re-allocation (5, 3). The small number of officials involved in managing the allocation of budgets between technologies made this kind of change something of soft target for lobbying (5). However, a DECC economist working on the RHI disputed this attribution of influence, citing underspend on other technologies: '*it was a bit of a no brainer because at the time that we were making those changes frankly it would've been inconceivable to not increase the amount of money that was being given to biomass because otherwise we would have been, as I said earlier, deciding that we weren't going to be spending the money at all*' (12).

This change clearly benefitted the biomass industry and as can be seen in Figure 2, following this change which was introduced in early 2014, the number of biomass combustion installations under the RHI increased rapidly. However, policymakers do not

confirm the role of the REA who may have an increased belief in their own policy impact. It may simply have happened without their input. It could however also be the case that the civil servant, did not want to admit that the biomass industry had successfully lobbied for this policy change and had power (the first face). Because of the lack of evidence that political power successfully changed policy, understanding this policy change using the dimensions framework is not possible.

5.6. Policy episode 6: Extra support for biomethane

In 2014, perceived high subsidies for biomethane, biogas which is upgraded and injected into the gas grid, led to a tariff review (DECC, 2014c). Biomethane was also subject to new rules for production sustainability (DECC, 2013d).

A new tariff, set above the level proposed in the review was introduced in February 2015 (DECC, 2015c). Since this date, the forecast expenditure on biomethane has been above (in some cases more than double) expected levels (BEIS, 2018b) suggesting that the new tariff has had little effect on reducing the growth of biomethane. The new sustainability rules were significantly less onerous than proposed in the review, favouring the largely agricultural biomethane industry (3, 5, 13). According to one civil servant:

'Biomethane is probably a good example where you've got some wealthy landowners who are well connected with people in the House of Lords and into the politicians and they can smooth the waters or at least make the right phone calls or send the right notes . There was quite a lot of that in that area...it was around all of the changes that we were thinking about for biomethane, there was a lot of that background activity going on... You would get messages coming down from ministerial offices and thinking where did that come from? And those people obviously knew how to go about doing that...I think in some cases it was the land owners involved, the people who owned the project...I think it did actually help on the tariff setting, we did let them off fairly lightly in the end on the

tariffs. It could've been a lot worse. And the sustainability stuff we did delay it for a long time, we did rethink on some of the numbers quite a bit as a reaction to some of that lobbying.' (14)

In the case of biomethane, the Government did not publish the responses to its consultations online (something it is not required to do (Cabinet Office, 2016)) and there is little publicly available information regarding this policy change. The Government response to the tariff review in 2014 does list consultation respondees and explains that a majority of respondees disagreed with some of the Government's cost assumptions but gives no indication of who said what (DECC, 2014b). However, the National Farmers Union (NFU), a trade association representing the farming industry and agricultural landowners, boasts on its website that the guarantee of a biomethane tariff, fixed until December 2014, was a '*policy-influencing 'win'*' (NFU, 2014).

A letter from Greg Barker, Minister in DECC, to the Renewable Energy Association and the Anaerobic Digestion and Biogas Association argues that the changed tariff was due to '*the volume of consultation responses received and our (DECC's) wish to provide industry with more certainty*' (DECC, 2014d). There is an implication that industry did indeed play a role in influencing DECC's decision. This appears to be an example of industry causing Government to do something it would not have otherwise done, the first dimension of power.

While the use of triangulation in this case suggests that industry was successful in influencing biomethane support policy in a number of ways, the lack of finely grained data makes understanding exactly why these specific changes happened, and who caused them, opaque. Responses to consultations, Government communications and other materials suggest that those looking to influence the policy for biomethane were successful but, other than data from one interviewee, there is nothing that proves that any particular actor had power to change policy. While there is a specific correlation

between the words of an interviewee regarding landowners and a recognition from the landowners that they have been successful, this does not indicate a causal relationship.

This episode does, however, show that interviewees perceived these wealthy landowners with political connections as politically powerful, having the ability to influence the policy process in a way that other actors in the heat policy network could not.

6. Discussion

As well as exploring the role of the power of actors in the development of the UK RHI, this article has highlighted the known complexities of analysing power. Key theoretical and methodological contributions are discussed in this section.

Our results indicate that the impact of actors' power has been an important factor in the development of the RHI, by speeding up the introduction of the policy into law (episode 1), by slowing down the implementation of the domestic scheme (episode 3) and by protecting the biomethane sector (episode 6). We also describe episodes in which socio-political power cannot be identified as a cause of change, suggesting either that something else is causing policy change or the methodology or our use of it is limited (potentially by the large granularity of analysis and the large number of policy episodes and issues considered).

The policy episodes describe various approaches and attempts to influence policy, including direct lobbying of parliamentarians, the use of evidence and taking advantage of the known concerns of policy makers. From the episodes, we have identified that policy change links not just to actors but also to the institutional situation of actors which can shape how power works and the wider context in which policy development is taking place.

The episodes also highlight that the ability to affect policy change is sometimes a case of 'not what you know, but who you know', with landowners in particular enjoying access to ministers (episode 6). This relationship appears to have influenced policy around

biomethane in a way that favours these well-connected interests, highlighting the importance of the personal position of actors in the policy process.

We have also observed the importance of the historical policy context and policy feedback in which earlier policy outcomes affect future policy development (Béland, 2010 and Lockwood et al., 2017). Unexpectedly rapid deployment under the Feed-In Tariff led to risk aversion within Government to demand based subsidy mechanisms such as the RHI (episode 3). This example highlights the importance of both the historical and institutional context in which power operates within the policy process.

Much of the existing literature which has considered the role of power in the development of policy for socio-technical transitions has highlighted the importance of 'incumbent' actors. Surprisingly, incumbents do not emerge from our analysis as a dominant force in the development of the RHI. While incumbents have been involved, the episodes emphasise the importance of small or niche actors who understand the policy and the technologies in detail, and can be nimble and focused in their attempts to influence policy. The reliance of Government on operational 'evidence' to develop policies which support low-carbon heat systems also empowers the niche actors who possess this information. Niche actors have also had power through trade associations, which have been seen to be heavily involved with the development of the RHI. The power of small and niche actors to promote transitions could therefore be an important area for future research as niche actors may emerge as important leaders in any potential transformation to low carbon heat in the UK. The episodes also indicate that even within the niche-level, power rivalries exist as actors aim to influence policy so that it suits their own specific interests or technologies.

However, at current levels of deployment, the RHI does not represent a threat to the UK's gas based heat regime and the RHI may be 'below the radar' of gas and heat incumbents. It may be that as the UK's ambition for a low-carbon heat transformation increases, so do

challenges by incumbents and the more recent behaviour of UK heat sector incumbents has been investigated elsewhere (Lowes et al., 2018).

Throughout the policy episodes, we have considered how the power identified could be linked to Lukes' 'dimensions of power'. We have identified the first dimension appearing to have an impact in three of the six episodes and have found that in all episodes actors have attempted to have power over others (the first face). However, these attempts and successes at causing policy change have been linked to contextual factors such as, actors being in positions of institutional authority, the role of evidence in policy design, previous policy experiences and direct personal relationships. This highlights the complexity of considering just one dimension of power and the importance of considering the wider context in which power struggles take place.

The analysis has provided fewer observable examples of the second and third dimensions of power and where we have observed these, the first dimension has also been identified. We identify aspects of all three dimensions in policy episode 1 with direct lobbying which caused MPs to vote in a particular way (first), MPs having the ability to put heat on the agenda using legislation (second), and the use of a campaign by NGOs to shape the preferences and thoughts of MPs (linked to ideas of the third dimension). We also observe elements of all three dimensions in policy episode 4, actors have attempted to affect tariffs (first) but as part of this, actors highlighted and played on Government concerns around previous policy issues to affect policy outcomes which both raised concerns onto the agenda (second face) and attempted to shape the preferences and concerns of policy makers (third face). In both of these examples, the different dimensions of power associated with policy change are clearly linked highlighting complex links between the dimensions of Lukes' framework.

Overall, the 'dimensions of power' framework has provided a useful lens through which power can be considered in the RHI policy process. However this research has highlighted the requirement when using Lukes' approach, of not just having to consider dimensions of

power, which are themselves contested and complex, but also to consider the wider context of power and policy development. In light of this complexity, we do see value in Lukes' approach, but believe narrative based process tracing studies, alongside Lukes, which take into account wider factors, can be key tools to unpick the role of power in the development of potentially transformative policies.

The episodes have highlighted examples where full triangulation is not possible due to grey data and interviewee access issues. Interviews have also highlighted administrative power struggles which are not the key analytical focus of the EAR instrument. While 'grey' data sources such as policy documents may contain useful information, in some instances, uncovering the reasons for policy change is not possible. Recognising the EAR approach as a useful tool to consider power and policy change, we believe the methodology could be strengthened by opening it up to consider the influence of administration actors and by using a further round of research which includes more finely grained policy analysis such as using Freedom of Information requests and further interviews. These approach may of course be constrained by the availability of time and therefore, investigating power requires careful attention to be paid to the availability of data and research timescales.

7. Conclusions and Policy Implications

We have used the EAR methodology to explore power and policy influence on the development of GB RHI and identified policy changes have been considered using Lukes' three dimensional power framework. We have provided a thick description of the development of a specific energy policy linked to the power of actors. More specifically, we set out to address three questions:

1. How has the RHI been affected by socio-political power?
2. How have actors attempted to influence the RHI?
3. What are the implications of this influence for the GB transformation to low-carbon heating?

We have shown that the GB RHI has been affected by the power of actors. Niche actors sped up the introduction of the scheme and have also had some success in increasing relative support for biomethane injection. We have also highlighted that the power to influence the RHI has not just been associated with heat industry actors; a senior Government bureaucrat also appears to have had significant power to affect the fundamental shape of the RHI policy. Attempts to influence by external interests from the heat industry include direct engagement with policy makers, the provision of data to policy makers, using personal connections with the legislature, media engagement. These approaches also often link to the wider policy context and build on relevant institutional foci.

As well as providing an important contribution to the literature on energy policy change, this analysis also contributes to literature focusing on power associated and socio-technical transitions. While much of the focus on power in the transitions field has emphasised the role of incumbents, we have shown in this example, the power of niche actors and others to influence policy. Understandings of the power of actors must therefore move beyond simple belief that incumbents are the key political actors. As important as they may be, other interested actors can affect policy change.

7.1. Implications for policy

Overall, the level of dominance of bioenergy based technologies within the non-domestic RHI was originally unanticipated and we have identified significant lobbying pressure to support bioenergy under the scheme. While lobbying by bioenergy interests does not appear successful in all policy episodes, some success has been recorded. Further investigations into the power of the bioenergy lobby and the implications of this power on energy system change could have merit.

While the domestic RHI scheme is now delivering a reduced proportion of biomass systems, in the non-domestic scheme, while total deployment levels have reduced, even in light of recent policy changes to increase the support for non-bioenergy technologies, bioenergy still

dominates the scheme. This is concerning not just because it was not anticipated but because of general uncertainties over bioenergy sourcing and sustainability. Specific policy implications highlighted by this analysis are considered below:

1. The importance of policy maker access to reliable data or 'evidence' has been highlighted by this research which has highlighted a near total reliance on vested interests to provide data on which the RHI has been based. Administrations either need to provide necessary resources to allow the collation of more reliable data for policy making (including a better understanding of the interests behind that data) or accept that the reliance on unfiltered industry data will impact on policy outcomes as has happened within the RHI.
2. The UK's 'lobbying act' (HM Government, 2015) described in section 1 is inadequate and could be strengthened. This case study has clearly identified non-government actors attempting to lobby. However, under the Lobbying Act, none of the lobbying practice would have been recorded because registration of in-house lobbyists is not required under the act and because actual lobbying activities are not recorded (Office of the Registrar of Consultant Lobbyists, 2017). The lobbying highlighted in this case study remains as opaque as it would have been if the Lobbying Act had not been implemented.
3. Policy influencing behaviours have real world impacts and can therefore be a significant element of energy system change. The impacts of successful lobbying recorded here are extremely likely to have affected the volume and type of renewable heat delivered by UK energy policy, compared to a counterfactual in which the policy influencing had not taken place. In this case study that includes:
 - i. An increase in the total amount of renewable heat delivered in the UK by the acceleration of the delivery of the RHI legislation identified in episode 1.

- ii. A reduction in the amount of domestic renewable heat produced at a domestic level caused by the slowing of the implementation of the domestic scheme identified in episode 3.
- iii. An increase in the proportion of biomethane delivered by the scheme and and a reduction in the carbon savings associated with each unit of biomethane as a result of changes described in policy episode 6.

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Declaration of Interest

Richard Lowes was previously employed in the UK gas industry and is currently an independent advisor to a UK gas network operator.

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Appendix A: List of Interviewees with dates of interview and type of organisation

1. DECC Civil Servant – 11/08/15 – Civil Service

2. Ground Source Heat Pumps Association representative - 13/10/15 – Trade Association

3. Renewable Energy Association head of policy - 19/05/15 – Trade Association
4. Renewable Energy Association ex-chief executive – 3/04/15 – Trade Association
5. Renewable Energy Association employee – 20/05/15 – Trade Association
6. DECC civil servant – 12/08/15 – Civil Service
7. Sustainable Energy Association chief executive - 10/07/15 – Trade Association
8. Anonymous – 16/06/15
9. Anonymous – 12/08/15
10. Kensa Heat Pumps chief executive – 05/05/15 – Heat Pump Company
11. DECC ex-chief scientist – 05/11/15 – Civil service
12. DECC civil servant – 12/08/15 – Civil service
13. Anaerobic Digestion and Bioresources Association head of policy – 20/05/15 – Trade Association
14. DECC civil servant – 06/08/15 – Civil Service
15. SSE employee – 05/06/15 – Energy Company