The Future of Renewable Heat Policy in the UK

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Submitted by James Constable to the University of Exeter as a dissertation towards the degree of Master of Science by advanced study in Energy Policy and Sustainability

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I certify that all material in this dissertation which is not my own work has been identified with appropriate acknowledgement and referencing and I also certify that no material is included for which a degree has previously been conferred upon me.
i. Abstract

Heat energy is the most carbon intensive and the most demanded form of energy in the UK. The UK is at the beginning of a transition to a low carbon economy, and all aspects of the energy system must decrease in carbon intensity. Decarbonisation of the heat sector has had very little policy support in the past. However, a new renewable heat policy support mechanism is now in the consultation phase of development. It was the aim of this project to assess the potential of this policy and any barriers that it may face in an underdeveloped market. To achieve this aim, previous developers of renewable heating systems were presented with a questionnaire and interviewed to identify their experiences when implementing renewable heating technologies. Stakeholder’s opinions and concerns in relation to their past experiences and the policy in consultation were then presented to DECC, so that an understanding could be formed of how renewable heat financial policy support is forming in the UK. It appears that whilst the policy in consultation has been thoughtfully designed in an attempt to incorporate every level of generation, until a framework for capital financing is provided, either through third party investment, government soft loans or continued grant support, the domestic sector will not be able to develop renewable heating technologies as readily as the non-domestic sector.
ii. Acknowledgements

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Endless thanks to Jo, for putting up with stress, anxiety and providing me with confidence.
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1 Introduction

This chapter will introduce the research project by contextualising and identifying research questions. It will provide a rationale for the basis of this research project, which will examine the future of renewable heat policy support.
1.1 Heat Use in the UK

The term ‘heat’, in the scope of this research, is the form of the energy that we use for cooking, space and water heating in all sectors of the economy; from domestic through to commercial and industrial, including the energy used in industrial process heating.

Heat energy is currently the most demanded form of energy in the UK. Energy consumed for heating accounts for 46% of UK final energy consumption, and 77% of energy use outside the transport sector. (DECC, 2009c) Heat use is exceptionally high in the domestic sector; 85% of energy used in the home is used to generate a form of heat, the other 15% being electrical energy used to power appliances and lighting. Of this 85% of domestic energy used for heating, 95% of this domestic heat demand is used for space and water heating. (DECC, 2009c)

Figure 1.i breaks down heat use into the three sectors, domestic, services (commercial) and industry (transport is included in the table to represent its contribution to heat use as nil). It is clear that heat is the majority component of energy requirement in all three sectors.

![Table](image)

**Figure 1.i: Heat Energy consumption by sector (DECC, 2009a)**

Only 1% of heat’s 46% contribution to our energy requirements currently comes from renewable sources. The methods of producing renewable heat are technologically variable and will be discussed further in the next chapter. Figure 1.ii breaks down UK heat supply. Gas (mains) is the largest fuel supply of the UK heat demand.
Heat production is extremely carbon intensive. Almost half, 49%, of all carbon emissions in the UK derive from a form of heat generation. Of this high contribution to the UK’s carbon footprint, the domestic (residential) and industrial sectors of our economy are proportionately the main carbon offenders; shown below in Figure 1.iii:

Industrial process heating coupled with both domestic and industrial space and water heating are the most carbon intensive activities in the UK. (BERR, 2008a)
1.2 Implementing and Incentivising Renewable Heat

The European Union has set a mandatory carbon reduction target of a 20% reduction in CO2e emissions by 2020. (European Commission, 2009) The UK Climate Change Act 2008 (CCA) provides a legal framework for ensuring that the UK meets its commitments to tackle climate change. The CCA requires that the UK reduce its CO2e emission levels by 80% of 1990 levels, by 2050. (DEFRA, 2008) This is a highly ambitious target and requires ambitious carbon reduction incentives to be provided by the Government.

The energy system, as shown above in the context of heat, is the largest contributing factor to the UK carbon emission crisis. In response to this, the Department of Energy and Climate Change (DECC) produced a target for 15% of all energy generated in 2020 to come from renewable sources. This target has been strategised in the Renewable Energy Strategy, 2009 (RES) and the Low Carbon Transition Plan, 2009 (LCTP).

The renewable energy generation targets have been broken down into the three sectoral forms of energy requirement; electricity, transport and heat. Of this 15% of total renewable energy generation, roughly 4% of renewable power is expected to come from heat, 2% from transport and 9% from electricity. (DECC, 2009c)

In an attempt to incentivise renewable technologies the government has employed the use of grants, use obligations and revenue based financial incentives; all of those which apply directly to heat will be detailed in the next chapter. However, it is clear when looking at Figure 1.iv that renewable heat has the biggest leap forward to make in terms of policy support and government incentives, if it is expected to make any real contribution to carbon reduction in the energy sector by 2020. As shown in Figure 1.iv, current policies in place which are aimed at delivering an increased uptake of
renewable heat (RH) are insufficient.

It is then, the ultimate objective of this research project to assess development barriers facing renewable energy sources of heat (RES-H) in light of a proposed policy mechanism that is set to be introduced in order for the UK to meet renewable energy generation targets.

1.3 Call for Research

In order to examine RES-H policy support and development in the UK within the remit of this thesis, the first step in this process is to choose a sample region, and a sample RES-H technology. As will be discussed further, policy support for RES-H technologies must encompass all viable technologies and systems. However in order to gain a detailed examination and discussion of RES-H policy development within the remit of this thesis it is necessary to caveat project scope. In light of this, this project will be examining wood-fuelled biomass policy development in the South West region of the UK for reasons detailed below.

A major area of the future renewable heat market is expected to be seen in the continued development of biomass technology and implementation; as will be discussed further. Whilst this project has a specific focus on the South West region of the UK, it is hoped that the results of this project may be applicable to other regions in the UK, or potentially effect future national policy.

The author of this project, having previously worked with Regen South West (the South West’s sustainable development agency), has noticed the high level of biomass installations that have been successfully implemented in the South West, shown below in Figure 1.vi;
This high concentration of wood-fuelled RES-H uptake has largely been due to the availability of grant-based policy support mechanisms. An established wood-fuel supply chain is emerging in the South West; discussed further in the next chapter and the literature review. Regen SW has also guided many businesses/organisations/peoples through the government grant applications and enabled a high level uptake of wood-fuelled biomass boilers in the South West. However, due to a restructuring of public finance due to the newly elected Coalition Government, regional sustainable development agencies will now find it more difficult to deliver business support in regards to renewable energy development. This may effect the implementation of RES-H technologies.

The grant schemes that have previously been in place to fund or part-fund biomass development across the UK have, as of 15th April 2010, now come to a close; most notably the Bio-energy Capital Grants Scheme which proved to be extremely over subscribed, along with the other grant schemes aimed at bio-technologies. (Biomass Task Force, 2005)

The UK, and by proxy, the South West, is now in a position where a new policy support mechanism has been proposed; the Renewable Heat Incentive (RHI). The RHI is currently under consultation and, as is stated in the consultation paper, will be brought in as the new policy support mechanism encompassing all RES-H technologies (the RHI is detailed in the Context chapter of this thesis). As will be seen, the future of UK RES-H policy is now in the process of phasing from one model of policy support to another, new, model of policy support. This policy shift has numerous potential
implications for future RES-H development in the UK; these implications are also prevalent in the South West wood-fuelled biomass sector.

In order to establish the potential effectiveness of the RHI in continuing to stimulate wood-fuelled RES-H market growth it is crucial to ascertain the barriers faced by previous grant-funded RES-H developers in the South West. This process of data collection may also provide an insight into future RES-H development in the South West under future policy support mechanisms. This research is important in that it aims to identify areas where further financial and non-financial policy support may be required for RES-H development and/or areas where the RHI, or future support mechanisms, may need to be modified in order for RES-H development to be available to every potential end-user of heat. It also seeks to provide stakeholder evidence where applicable, of where the RHI is being looked to as a well constructed and deliverable support mechanism.

Through the literature review it will become clear that there has been very little research carried out into the: options available for RES-H policy support mechanisms, the barriers to wood-fuelled RES-H development, and feedback from previous wood-fuelled RES-H developer’s policy support preferences. However, by sampling a region that has had success delivering a particular technology, in this case wood-fuelled RES-H, it is possible to ascertain the extent of the positive effects that the RHI, or indeed any future RES-H policy support mechanism might have on an emerging market, and the barriers that it may need to overcome.
1.4 Aims and Objectives

Table 1 below details the aims and objectives (A&O) of the research project:

1. Examine literature, both industry and academic, that discuses the various barriers, options and preferences for financial RES-H policy support.

2. Research and examine barriers to previous wood-fueled RES-H developments in the South West; both financial, and non-financial.

3. Research the effect that a revenue-based funding mechanism, i.e. the RHI, would have on barriers to South West wood-fueled RES-H development.

4. Highlight areas where future RES-H policy support may need to alter in order to fully actualise RHI potential in the UK.

The following chapter, ‘Context’ provides the reader with the up-to-date understanding of the RHI and wood-fuelled RES-H technology that is required to understand the motivations and research outcomes of the above A&Os.

The Literature Review chapter provides the reader with a comprehensive examination of previous academic and industry research into: the options available for RES-H financial policy support, the previously identified barriers to wood-fuelled RES-H development, and the previously catalogued stakeholder policy support preferences including any documented motivations for this preference.

The ‘Methodology’ provides the rational for, and the design of, the chosen research methods. The ‘Methodology’ also correlates the A&Os with the chosen research methods. Following this, the ‘Results and Discussion’ chapter: presents data that has been collected through the research methods, it focuses on key issues which have presented themselves through the research and discusses the outcomes of the A&Os detailed above. The project is then concluded and further areas of research are identified.
2 Context

This section provides the reader with fundamental information that is required to fully contextualise the aims and objectives of the research project. Technology and policy design of the RHI will be introduced.
2.1 **RES-H Technologies**

There are various renewable heating systems and technologies available on the market in the UK. They include, and are not limited to;

- **Biomass Boilers**
  - wood-fuelled
  - energy from Waste (EfW)
  - municipal solid waste (MSW)
  - energy crops
- **Ground Source Heat Pump**
- **Air Source Heat Pump**
- **Solar Thermal**
- **Biogas**
- **Geothermal**

In the case of this research project, the technology used to discuss RES-H policy development will be wood-fuelled biomass; the reasons for this having been identified in the previous chapter. A wood-fuelled biomass renewable energy source of heat (RES-H) uses wood-fuels, burnt in a boiler to produce hot water, steam and in some cases hot air. All forms of heat produced can be used by the operator of the technology to provide all of, or additional heating requirements to a building or industrial process.

To facilitate an understanding of the complexities involved with designing an effective RES-H financial policy support mechanism for wood-fuelled RES-H, a general understanding of the technology is required. Figure 2.i broadly depicts the variables and outcomes involved with operating a wood-fueled RES-H system.

In an attempt to stimulate a high quality installation and technology quality in the UK renewable energy market, the Government has introduced The Microgeneration Certification Scheme (MCS). MCS was born of BERR’s 2006 Microgeneration Strategy. The MCS standard has now become the hallmark required for any RES-H or RES-E (renewable energy source of electricity) technology to be viable to claim government financial support. (BERR, 2006) MCS is as much an industry standard training requirement in as much as it is a consumer guarantee of government approved quality.
Figure 2.i: VUE Map of Wood-fuelled RES-H System
2.2 The Renewable Heat Incentive (RHI)

A copy of the Renewable Heat Incentive Consultation is attached as Appendix A to this project, it is recommended that the reader understands the RHI in order to fully contextualise this research project.

In order to present the various methods of RES-H policy support and examine the barriers to RES-H development in regards to the proposed RHI and the objectives of this research project, it is firstly important to understand the basic principle of the proposed policy support mechanism; the RHI.

The RHI is a new government policy proposal that intends to provide financial assistance to households and businesses that wish to install and operate RES-H technologies across the UK. (DECC, 2010a)

It is important to note that the RHI does not yet exist as a working government financial policy support mechanism. However the RHI is required, through the Renewable Energy Strategy 2009 (RES), to exist as the primary support mechanism for increased RES-H implementation in order for the UK to meet its RE generation targets. (DECC, 2009c) This proposed policy is now in the consultation process of policy development. In the consultation paper (which opened February 2010 and closed for response in April 2010) the proposed start month is in April 2011. The policy is proposed to accept new development applications up until 2020. (DECC, 2010a)

As planned, the RHI will provide financial support to the following technologies:

- Solid Biomass (wood-fuel biomass is categorised as solid biomass)
- Ground-Source Heat Pumps (GSHP)
- Bioliquids
- Bio-gas (on-site combustion)
- Air-Source Heat Pumps (ASHP)
- Solar Thermal
- Biomethane Injection (mains gas grid injection)

The RHI is a revenue-based policy support mechanism; meaning that the RHI makes payments to RES-H operators in instalments across an agreed timescale and number of payments. The RHI, would operate as a similar system to the Feed-in-Tariff (FiT) policy for electricity; the installed payments to the owner/operator of the renewable energy (RE) system are calculated based on particular tariff levels which are technology specific. (DECC, 2009d)
However, unlike the FiT, which has a 5 MW single-site upper limit of generation, the RHI is intended to cover all scales of solid biomass generation (inclusive of wood-fueled biomass); the upper banding of solid biomass is currently financially incentivised through the Renewable Obligation’s support. (DECC, 2009f) As shown in Figure 2.ii any technology operating on a small to medium scale is to have its tariff payments calculated through a process known as ‘deeming’. This is contrary to the FiT which sees end-user payments calculated with a tariff level multiplied by a metered RES-E generation amount. Deeming, within the context of this project, is the process whereby a home or building’s required heat load is calculated and revenue payments to support RES-H running costs are made in accordance to the deemed heat requirement of the home/building. (DECC, 2010a) The proposed tariff levels in accordance to each technology are detailed below in Figure 2.ii.

The RHI proposal has been designed as a simple and potentially highly successful policy support mechanism that may enable the UK to meet its ambitious 15% renewable energy generation targets. However, as shown in Table 2, the RHI is an example of only one method of RES-H policy support. As will be discussed, academic and industry literature suggests that some stakeholders in the UK RES-H market may prefer a modified or alternative RES-H support mechanism. (Thornley, P. and D. Cooper, 2008)
### Small installations (1)

<table>
<thead>
<tr>
<th>Technology</th>
<th>Scale</th>
<th>Proposed tariff (pence/kWh) (2)</th>
<th>Deemed or metered (3)</th>
<th>Tariff lifetime (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solid biomass</td>
<td>Up to 45 kW</td>
<td>9</td>
<td>Deemed</td>
<td>15</td>
</tr>
<tr>
<td>Bioliquids (7)</td>
<td>Up to 45 kW</td>
<td>6.5</td>
<td>Deemed</td>
<td>15</td>
</tr>
<tr>
<td>Biogas on-site combustion (5)</td>
<td>Up to 45 kW</td>
<td>5.5</td>
<td>Deemed</td>
<td>10</td>
</tr>
<tr>
<td>Ground source heat pumps (8) (9)</td>
<td>Up to 45 kW</td>
<td>7</td>
<td>Deemed</td>
<td>23</td>
</tr>
<tr>
<td>Air source heat pumps (9)</td>
<td>Up to 45 kW</td>
<td>7.5</td>
<td>Deemed</td>
<td>18</td>
</tr>
<tr>
<td>Solar thermal</td>
<td>Up to 20 kW</td>
<td>18</td>
<td>Deemed</td>
<td>20</td>
</tr>
</tbody>
</table>

### Medium installations

<table>
<thead>
<tr>
<th>Technology</th>
<th>Scale</th>
<th>Proposed tariff (pence/kWh) (2)</th>
<th>Deemed or metered (3)</th>
<th>Tariff lifetime (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solid biomass</td>
<td>45-500 kW</td>
<td>6.5</td>
<td>Deemed</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>2 (fuel tariff)</td>
<td>Optional: for metered kWh above deemed number of kWh</td>
<td>Deemed</td>
<td>15</td>
</tr>
<tr>
<td>Biogas on-site combustion (5)</td>
<td>45-200 kW</td>
<td>5.5</td>
<td>Deemed</td>
<td>10</td>
</tr>
<tr>
<td>Ground source heat pumps (8)(9)</td>
<td>45-350 kW</td>
<td>5.5</td>
<td>Deemed</td>
<td>20</td>
</tr>
<tr>
<td>Air source heat pumps (6)(9)</td>
<td>45-350 kW</td>
<td>2</td>
<td>Deemed</td>
<td>20</td>
</tr>
<tr>
<td>Solar thermal</td>
<td>20-100 kW</td>
<td>17</td>
<td>Deemed</td>
<td>20</td>
</tr>
</tbody>
</table>

### Large installations

<table>
<thead>
<tr>
<th>Technology</th>
<th>Scale</th>
<th>Proposed tariff (pence/kWh) (2)</th>
<th>Deemed or metered</th>
<th>Tariff lifetime (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solid biomass</td>
<td>500 kW and above</td>
<td>1.6 – 2.5</td>
<td>Metered</td>
<td>15</td>
</tr>
<tr>
<td>Ground source heat pumps (8)(9)</td>
<td>350 kW and above</td>
<td>1.5</td>
<td>Metered</td>
<td>20</td>
</tr>
</tbody>
</table>

### Biomethane injection

<table>
<thead>
<tr>
<th>Technology</th>
<th>Scale</th>
<th>Proposed tariff (pence/kWh) (2)</th>
<th>Deemed or metered</th>
<th>Tariff lifetime (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biomethane injection</td>
<td>All scales</td>
<td>4</td>
<td>Metered</td>
<td>15</td>
</tr>
</tbody>
</table>

Figure 2.ii: RHI Tariff Levels (DECC, 2010a)
3 Literature Review

This section will present the academic, industry and policy relevant literature required in order for the reader of this research to be adequately contextualised into the current debate surrounding renewable energy sources of heat (RES-H) policy development. As will be seen, unfortunately there has been very little academic research carried out in regards to the best policy support option for wood-fueled RES-H policy support and subsequent RES-H uptake in the UK. It is the aim of this research project to contribute to this important area of research.
3.1 RES-H Financial Support Mechanisms

This section will explain and examine the various policy options for financial RES-H government support. Analysing the various methods of RES-H policy support is crucial to successfully fulfilling the aims and objectives outlined in chapter 1.

There are 6 known financial policy support mechanisms that can be used to direct funding towards RES-H development, all of which are detailed below:

<table>
<thead>
<tr>
<th>Mechanism</th>
<th>Description</th>
<th>Examples in the UK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenue Based (RHI)</td>
<td>Provide a guaranteed price per unit (pence per Kw) for energy production and use. Calculated revenue streams are fixed for an agreed time frame (grandfathered), in accordance with maintenance and continued use of the technology.</td>
<td>The FiT is a revenue based financial policy mechanism. Used to support microgeneration in the UK, &lt;5MW. The RHI is a proposed revenue based funding mechanism. (DECC, 2010a)</td>
</tr>
<tr>
<td>Grant Schemes (BECGS)</td>
<td>Provides up-front capital payments to RE developers. Useful in that they tackle high up-front costs associated with RE technologies. (NERA, 2010)</td>
<td>Historically the main support mechanism for RES-H development in the UK, covering all or part technology cost. The Bio Energy Capital Grants Scheme (BECGS) has been the primary provider of financial RES-H support, until it closed; 2010. (DEFRA/BERR, 2007)</td>
</tr>
<tr>
<td>Use Obligation (RHO)</td>
<td>Suppliers of heat in the UK would be required to produce a certain amount of RH. Over time this amount increases to meet government targets. Utilities that fail to meet generation targets are financially penalised, the proceeds of this penalisation being passed on to conforming suppliers who uphold the generation commitment.</td>
<td>The Renewable Obligation (RO) already supports RE development in this way. Prior to the design of the RHI, a renewable heat obligation was proposed in the 2007 Energy White Paper (EwP). (DECC, 2007)</td>
</tr>
<tr>
<td>Emissions Trading Scheme (ETS)</td>
<td>An ETS places an emissions trading allowance on carbon intensive sectors. These allowances are then traded between selected stakeholders. This process would make fossil fuel (FF) heat generation more expensive, and therefore incentivise RES-H development.</td>
<td>The EU ETS exists currently, however without a high enough carbon price to incentivise RE development. (NERA, 2010)</td>
</tr>
<tr>
<td>Soft loans (PAYS)</td>
<td>Loans provided by the government or third party organisation aimed at driving down up-front capital cost of RE system and energy efficiency (EE) installation. The loan is ‘soft’ due to low interest rates and/or payback amounts being calculated as proportion of avoided costs that come about as a result of property improvements.</td>
<td>The Pay as You Save (PAYS) system may develop in order to incentivise domestic and, to some extent, commercial property owners to increase EE. The policy has been proposed in the ‘Warmer Homes, Greener Homes’ 2010 government strategy. (DECC, 2010b)</td>
</tr>
</tbody>
</table>
Carbon Reduction Commitment (CRC)

The CRC is a ‘cap and trade’ system designed to lower emissions levels of high energy users. The CRC began 1st April 2010. (EA,2010)

It is important to note that whilst the above analysis of varying policy support mechanisms is broad, it is possible for a policy to be constructed from aspects of more than one financial policy support mechanism.

The aim of a financial support mechanism within the context of this research is to provide financial assistance to a RES-H technology/market that would otherwise, without government support, be unable to contribute to national RE generation targets. Peter Conner’s ‘UK Renewable Heat Policy: Lessons from Renewable Electricity Policy’ states that the goals of renewable heat policy are not really any different to the goals of renewable electricity policy. (Conner, 2008) They are as follows:

**Table 3: Aims of RES-H Policy Support**

<table>
<thead>
<tr>
<th>Aims</th>
</tr>
</thead>
<tbody>
<tr>
<td>Displacement of climate change emissions from fossil fuel energy sources</td>
</tr>
<tr>
<td>Reduction in dependence on fossil fuel imports and increased security of energy supply</td>
</tr>
<tr>
<td>Increased diversity of energy sources</td>
</tr>
<tr>
<td>To assist in development of new technology</td>
</tr>
<tr>
<td>Stimulation of growth of new industries and capture of attendant benefits</td>
</tr>
</tbody>
</table>
3.2 EU RES-H Development

A large scale implementation of RES-H technologies has occurred in both Denmark and Sweden; this is shown below in Figure 3.2.i. Both countries have instigated district heating (DH) to support RES-H technologies, whilst both Germany and Belgium have not; interestingly Germany and Belgium have progressed less successfully than Denmark and Sweden without the use of DH.

<table>
<thead>
<tr>
<th>Market</th>
<th>% market share for renewable heat (est.)</th>
<th>Key drivers</th>
</tr>
</thead>
</table>
| Denmark | 13%                                    | • Widespread use of district heating to supply residential and commercial sectors  
                              | • Installation of heat transmission network mandated through planning legislation; obligatory connection of small to large scale CHP to heat network (renewable and gas CHP); and a ban on electric heating |
| Germany | 5%                                     | • Largely CHP-led, with generous feed-in tariffs for biomass/biogas under the EEG  
                              | • Public support, sympathetic planning regime and use of grants for smaller applications |
| Sweden  | 20%                                    | • Extensive deployment of district heating, primarily biomass-led CHP        
                              | • Capital grants focused on extending the heat transmission network, reduced VAT on fuel, abundance of fuelstock and a planning regime oriented to district heating |
| Belgium | 2%                                     | • Green certificate mechanism similar to the Renewables Obligation, but revenues based on carbon savings to incentivise the use of CHP (particularly renewable CHP) |

Figure 3.2.i: RES-H Support mechanisms (E&Y, 2007)

Ernst and Young’s 2007 report, which was jointly commissioned by both DEFRA and BERR, clarifies the correlation between large scale RES-H implementation and district heating (DH) network/infrastructure (DHN) development in EU countries. The report states that the development of DHNs in the EU member states with the largest % market share for RES-H has only occurred due to grant-based government financial support for DHN implementation in these countries. (E&Y, 2007) Interestingly, the UK currently has no plans to implement such a grant-based DH initiative. (DECC, 2010a)

A 2009 Poyry report to DECC titled ‘The Potential and Costs of District Heating Networks’, examines the possible options for DHN support in the UK. Similarly to the Ernst and Young (E&Y) report, Poyry argue that government grant-based capital finance schemes are the most cost effective solution to the large financial barrier presented by DHN implementation. (Poyry, 2009)

The Poyry report models potential DHN costs, against stand-alone RES-H technologies (technologies without access to an established DHN) and shows that a wood-fueled RES-H system which is combined with a DHN is ultimately more cost effective in the longer term due to the high heat distribution capacity that a DHN can enable a RES-H system to attain. When assessing the
success of RES-H systems abroad, both E&Y and Poyry reports show that large scale RES-H implementation in certain EU member states has been dependent on government financial support for increased DHN capacity. (E&Y, 2007; Poyry, 2009) Importantly, both Denmark and Sweden have achieved large scale RES-H development due to a high level of domestic DHN connection. Whilst the industrial sectors in both countries have also implemented the use of wood-fueled RES-H technologies, domestic sector RES-H powered DHN connection is the main driver for high RES-H uptake in both countries. (E&Y, 2007)

In regards to wood-fueled biomass, whether used as a stand-alone RES-H technology, utilised in a combined heat and power (CHP) capacity, or used in both forms alongside a DHN, the successful development of this RES-H technology has been as much influenced by fuel supply availability as it has been influenced by EU funding mechanisms and nationally specific CC targets. Research submitted to the EU, via the RES-H Policy Research Project titled ‘Target setting for RES-H/C in Upper Austria’ clarifies this important aspect of RES-H development capacity. Upper Austria is very high in potential biomass wood-fuel and as a result of this; the potential RES-H development in the region is equally very high. The local government has set the ambitious target of delivering 100% of domestic space heating in the area to come from RES-H sources (primarily wood-fueled) by 2030. (Ohlinger et.al, 2010) The biomass potential of the region against the central scenario of RES-H uptake is shown below in Figure 3.2.ii and Figure 3.2.iii.

Figure 3.2.i: Upper Austria Biomass Potential

Figure 3.2.ii: U-A Biomass Fuel Mix
Progress in the EU shows us that as central to fuel supply capability is the important variable of regional climatic conditions. Heating requirement, whether it be renewable or not, as is stated and explained in ‘Recognising the Potential for Renewable Energy Heating and Cooling’ (Seyboth, K., L. Beurskens, 2008) is subject to the climatic conditions of a country or region. The messages from Seyboth and Beurskens research are mirrored in Scotland’s ‘Renewable Heat Strategy; Recommendations to Scottish Ministers’, when this policy report implies that because of extreme cold weather in comparison to the rest of the United Kingdom, Scotland must consider both RES-H and EE implementation to be of primary importance when contributing to CC and emissions reductions objectives. (Scottish Government, 2008)

The government designed financial support mechanisms that have been used to incentivise RES-H market development abroad have been, as shown in Figure 3.2.i wide ranging. Germany has introduced an ‘RHI style’ revenue based support mechanism, and has already superseded our RH generation targets. However, it is interesting to state that Sweden, who has the largest national market share of RH in the EU which has of course occurred in the domestic sector, have achieved this with capital grant policy support. (E&Y, 2007) It is however widely recognised that a revenue-based policy mechanism is the most widely accessible policy instrument known. (Poyry, 2009) There has been no known qualitative research of stakeholder feedback in regards to the most easily understandable and accessible policy support option available for RES-H implementation. However, progress in the EU would suggest that employing one or more, grant-based, revenue-based or use-obligation policy mechanism across a wide range of RES-H associated applications has been the most successful when promoting large-scale RES-H development.
3.3 UK RES-H Market Potential

The costs associated with implementing, maintaining and operating RES-H options vary significantly depending on; the technology, the size of the technology, and the sector in which the technology is implemented. However one aspect of all future UK RES-H market potential scenarios that have been produced is invariably consistent. In every market potential forecast the non-domestic sector is predicted to contribute the largest proportion to UK RES-H development; predominantly in the form of solid biomass (inclusive of wood-fueled RES-H). The high percentage contribution to UK RES-H development in the industrial sector contradicts the trend of high percentage up-take seen in EU domestic sectors.

The literature states that the UK will not reach RES-H targets unless RES-H technologies are implemented at varying levels of generation capacity and through multiple modes of technology. (DECC, 2009g) In this way, the future of the UK RES-H market is no different to the future of the RES-E market. Figure 3.3.i shows the results of NERA’s ‘Scenarios for Renewable Heat Report’.

![Figure 3.3.i: NERA scenarios for renewable heat (NERA, 2009b)](image)

It is clear, from Figure 3.3.i, that non-domestic biomass boilers have been forecasted to contribute the largest proportion of RH generation in all three NERA scenarios. Aside from solar thermal (which is forecasted to contribute the smallest proportion of RES-H
development), every technology is expected to have a higher up-take and TWh production in non-domestic sectors. NERA, who produced this scenario, also produced in 2009, ‘The Design of the Renewable Heat Incentive’ report. As NERA have forecasted a large-scale uptake of industrial wood-fueled biomass boilers and have also played a large part in the design of the RHI, it is possible to assimilate that NERA’s contribution to the design of the RHI has been with large-scale industrial development in mind. (NERA, 2010)

Research has shown that if large scale RES-H development occurs, on a commercial and industrial level, then the requirement for smaller-scale domestic RES-H development will decrease. (NERA, 2009b) Figure 3.3.ii was produced by NERA as part of the ‘Design of the Renewable Heat Incentive’ consultation report.

Figure 3.3.ii is an example of how large scale biomass-boilers are less expensive per £/MWh (in terms of policy support costs) than small scale (<30Kw systems). Large scale biomass RES-H, without access to DHNs are more suited to industrial applications like process heating and large space heating; leaving more policy-expensive small scale RES-H technologies behind to cater for the domestic sector. (NERA, 2010)

Figure 3.3.ii; Market Potential for Biomass Boilers (NERA, 2010)
### 3.4 Stakeholder Financial Policy Preference

A ‘stakeholder’, within the context of this research is a person/business/organisation that may potentially be, or has been affected by financial RES-H policy support. Through an examination of stakeholder policy preferences it is possible to gain an understanding of the implications of these preferences on RHI market potential.

<table>
<thead>
<tr>
<th>Support mechanism</th>
<th>Medium to large installations</th>
<th>Rank</th>
<th>Residential installations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heat obligation*</td>
<td>1</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Premium price</td>
<td>2</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td><strong>Feed-in tariff</strong></td>
<td>3</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Tax incentive</td>
<td>5</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Grant</td>
<td>8</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>ETS</td>
<td>7</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Renewable Obligation</td>
<td>8</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

Figure 3.4.i Stakeholder Policy Preferences (Ernst & Young, 2007)

Ernst and Young consultancy group (E&Y), in 2007 produced a report on behalf of DEFRA/BERR on the potential support mechanisms for the UK RES-H market. ‘Renewable Heat Support Mechanisms’ has found that in general, industry and commercial stakeholders would ‘prefer to see some kind of feed in tariff for heat’ (Ernst & Young, 2007) as it seems to benefit all scales of stakeholder preference more holistically than other financial support options. This has been stated even though it is clear from viewing Figure 3.4.i that a revenue-based support mechanism was ranked very low with previous residential developers (second lowest), and relatively highly with medium to large scale commercial/industrial developers (third highest). It is important to note the age of this research may mean that stakeholder preferences have changed since the publication of this report.

However, the summarised results of E&Y’s research, shown in Figure 3.4.i, provide an interesting insight into the potential uptake of RES-H technology in regards to the introduction of the RHI in April 2011. It is possible to state that, if a use obligation (perhaps the previously proposed RHO) was introduced instead of the RHI, the UK RES-H market would see higher growth in medium to large scale RES-H installations than under the proposed RHI, which is more favoured by these stakeholders. It is also interesting to note that grant mechanisms, which have up until recently (2010) been the main support mechanism for RES-H development...
in the UK, have been ranked highest by residential stakeholders. E&Y explain this sectoral preferential difference to have occurred primarily because of:

A) *The complicated nature of use obligations*; making it difficult for residential owner/operators of RE-H technology to understand and access a use obligation policy support mechanism. (E&Y, 2007)

B) *The front-loaded quality of grant support*; meaning that a grant enables residential and small-scale installations to overcome high up-front capital costs that cash rich businesses/organisations often find manageable to justify through avoided costs advantages associated with low wood-fuel prices. (E&Y, 2007)

Peter Conner, from the University of Exeter has produced what is by far the most comprehensive academic research into RES-H policy design and implementation in the UK. Conner has also produced research which has directly identified stakeholder RES-H policy preferences. The paper ‘Documentation of Consultation Process on the Proposed 2020/2030 RES-H targets in the United Kingdom’ interviewed the following stakeholders and experts:

Table 4: Previous RES-H Stakeholders/Academics Interviewed (Conner, 2009c)

<table>
<thead>
<tr>
<th>Name</th>
<th>Organisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bob Towse</td>
<td>Heat and Ventilating Contractors’ Association (HVCA)</td>
</tr>
<tr>
<td>Tim Rotheray</td>
<td>Combined Heat and Power Association (CHPA)</td>
</tr>
<tr>
<td>Nathan Billings</td>
<td>Capture Energy</td>
</tr>
<tr>
<td>Richard Westover</td>
<td>A Greener Place</td>
</tr>
<tr>
<td>Gideon Richards</td>
<td>Consulting with a Purpose (CWP)</td>
</tr>
<tr>
<td>Tim Otley</td>
<td>SITA Ltd</td>
</tr>
<tr>
<td>Chetan Lad</td>
<td>British Gas New Energy</td>
</tr>
<tr>
<td>Rachel Cary</td>
<td>Green Alliance</td>
</tr>
<tr>
<td>Doug Parr</td>
<td>Greenpeace</td>
</tr>
<tr>
<td>Grace Bennett</td>
<td>Micropower Council</td>
</tr>
<tr>
<td>Tony Book</td>
<td>Riomay Heating Ltd</td>
</tr>
<tr>
<td>Brian Kennelly</td>
<td>Earth Energy Ltd</td>
</tr>
<tr>
<td>Terry Seward</td>
<td>Federation of Environmental Trade Associations (FETA)</td>
</tr>
<tr>
<td>Hazel Williams</td>
<td>RegenSW</td>
</tr>
<tr>
<td>Stewart Russell</td>
<td>Edinburgh University</td>
</tr>
</tbody>
</table>

Interestingly, the majority of stakeholders interviewed welcomed the introduction of the RHI. This, to some extent correlates with E&Y’s stakeholder preference results detailed in Figure 3.4.i. However, ‘[m]any of the stakeholders were keen to emphasize a belief that a successful strategy would need to include multiple instruments to allow the diverse barriers which limit the greater implementation of renewable heat to be overcome’ (Conner, 2009a). This is a key
issue within this research. Conner’s research has also highlighted stakeholder concerns regarding the potential abuse of a revenue based policy support mechanism; an over-assessment of heating needs (see ‘deeming’ in chapter 2) can lead to an over estimation of subsidy requirements; this is known as a ‘perverse incentive’ (Conner, 2009b). It also appears that some stakeholders are looking to re-package future RES-H assets in order to ‘operate on a leasing basis wherein a company pays for the technology then claims the subsidy, with the householder or other building user benefitting from cheap or subsidised heat energy’ (Conner, 2009b). This market behaviour has already been seen in the renewable energy sources of electricity (RES-E) market as a result of the introduction of the FiT. Many models of RES-E financing are beginning to spring up, including Energy Service Companies (ESCOs). (Conner, 2008) There is no direct research to suggest that this will not occur in the RES-H market. Whilst an in-depth analysis of third-party financing is important to the future of market development, their construction is not the focus of this research, however the extent to which they may be required is a central focus of the project.

The literature suggests that whilst commercial and industrial stakeholders have been vocal about their preferred RES-H policy support mechanism, they are also far more able to adapt to policy change than the domestic sector. (E&Y, 2007; Conner, 2009a, 2009b) This ability to adapt in the face of policy induced opportunity may explain the high projected contribution of non-domestic RES-H development outlined in the previous section. However this opinion is not stated in the literature.
3.5 **Barriers to RES-H Development**

This section will detail the non-financial barriers that previous research has identified in regards to RES-H development. An identification of the potential non-financial barriers that South West wood-fueled RES-H development might face is crucial when considering the effect that a proposed financial mechanism (RHI) may have on these barriers.

As defined by Enviros’ report on behalf of BERR detailing the barriers to RES-H development:

A **Barrier** is something that prevents the maximum uptake of renewable heat:
- reduces or delays capacity being installed; or
- prevents or delays installed capacity running at optimal output.

**Demand side barriers**: these put a heat user off using renewable heat (either resulting in them using an alternative non-renewable fuel or in deciding not to replace existing heating equipment entirely).

**Supply side barriers**: these stop getting the heat equipment up and running how, when and where the customer wants.

(Enviros; 2008a, 2008b)

Enviros consultancy group have produced what is by far the most comprehensive examination of barriers to RES-H development in the UK. As noted above, known barriers to RES-H development can be split into the two categories of; demand and supply side barriers. It is important to note that certain barriers to RES-H development can be categorised as both demand and supply side barriers. The table below has been constructed using information from Enviros, NERA, Peter Conner’s research and also from BERR’s ‘Heat: Call for Evidence’ consultation. Please see Appendix C for the full Enviros research findings in relation to non-financial biomass RES-H barriers.

**Table 5: Barriers to RES-H Development**

<table>
<thead>
<tr>
<th>RES-H Barrier Identified</th>
<th>Barrier Description</th>
<th>Supply Side Barrier?</th>
<th>Demand Side Barrier?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inertia</td>
<td>Resistance to change from one heating system to another due to personal feelings towards either the former or proposed new heating system.</td>
<td>No</td>
<td>Yes; end users are often reluctant to move from a method of heating that they are familiar with. This can be due to concerns around whether the quality of heat supplied will be maintained or due to uncertainty around the costs &amp; practicalities of the alternative options.</td>
</tr>
<tr>
<td>RES-H Barrier Identified</td>
<td>Barrier Description</td>
<td>Supply Side Barrier?</td>
<td>Demand Side Barrier?</td>
</tr>
<tr>
<td>-------------------------</td>
<td>--------------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Lack of Skilled Professionals</td>
<td>Inadequate levels of MCS accredited installation professionals has the potential to slow or halt RES-H technology installation</td>
<td>Yes; a limited availability of skilled installers will pose problems for suppliers.</td>
<td>Yes; fear that in case the equipment fails to work repairing will be delayed might put end users off.</td>
</tr>
<tr>
<td>Planning</td>
<td>Lorry movements, visual impact, noise, fuel incineration etc. pose a significant barrier to the deployment of biomass heat plants.</td>
<td>Yes; planning is a prerequisite for the successful installation of biomass plants.</td>
<td>No</td>
</tr>
<tr>
<td>Potential availability/ security of wood-fuel supply</td>
<td>Fuel import and handling infrastructure is expected to cause a constraint to future RES-H development.</td>
<td>Yes; unreliable fuel supply makes it difficult for suppliers to secure a constant heat supply</td>
<td>Yes; unreliable fuel supply can be perceived as unreliable heat supply which could put end users off.</td>
</tr>
<tr>
<td>Potential sustainability of wood-fuel supply</td>
<td>Recent publicity has heightened concern over the negative impacts on wider environmental issues e.g. rape seed oil and social issue in competition with food production. There is a risk that all biomass is associated with biofuels and so this distrust feeds through to other fuels where these concerns may not actually be applicable.</td>
<td>No</td>
<td>Yes; a lack of confidence in the sustainability of wood-fuel supply can turn people off the idea of implementing RES-H.</td>
</tr>
<tr>
<td>A lack of confidence in biomass technology</td>
<td>Despite the maturity of the technology, plant performance has often fallen bellow desired standards.</td>
<td>No: there is sufficient well established equipment Available from other countries such as Austria.</td>
<td>Yes; past problems may cause negative perceptions of the technology.</td>
</tr>
<tr>
<td>Hassle-Factor</td>
<td>Extra time and effort required to use non-conventional system or switch system. Research, planning permission, finding an installer, installation of equipment etc</td>
<td>No</td>
<td>Yes; increased time and effort requirement on the developer’s side is a significant cost constraint.</td>
</tr>
<tr>
<td>RES-H Barrier Identified</td>
<td>Barrier Description</td>
<td>Supply Side Barrier?</td>
<td>Demand Side Barrier?</td>
</tr>
<tr>
<td>--------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>Air Quality Issues</td>
<td>The burning of biomass can present issues for air quality. This can have an impact in two different ways (i) biomass boilers may be required to meet stringent emissions standards (affecting fuel and technology choice) and (ii) their use may not be possible in some areas at all if it would take air quality standards beyond limits specified in the Clean Air Act.</td>
<td>Yes; planning permission will not be granted where the combustion of biomass would cause air quality to deteriorate below accepted levels.</td>
<td>No</td>
</tr>
<tr>
<td>System Design</td>
<td>The nature of wood-fueled RES-H means that system design is dependent on the design of the building/heating requirement.</td>
<td>Yes; Inadequate system design can make fuel feeding and supply of wood-fueled RES-H systems difficult.</td>
<td>Yes</td>
</tr>
<tr>
<td>Selling electricity</td>
<td>There is a need for users to understand the economic impacts and practical requirements of selling electricity to the grid for a project to be considered financially viable.</td>
<td>Yes; infrastructure costs and associated administration can be costly and time consuming.</td>
<td>Yes; determining ROC allocation complicated if user is not familiar with the scheme and giving a market price, can be uncertain.</td>
</tr>
<tr>
<td>Availability of wood-fuel</td>
<td>The number of existing wood-fuel supply companies is not sufficient to achieve a significant uptake of biomass heat.</td>
<td>Yes: a lack of suppliers will automatically limit supply.</td>
<td>Yes; end-users prefer local fuel suppliers where necessary.</td>
</tr>
<tr>
<td>Availability of biomass</td>
<td>Manufacturing capacity in the UK is fairly limited. However, equipment is widely available from other European countries such as Austria and Italy.</td>
<td>Yes: suppliers rely on the availability of high specification kit.</td>
<td>No</td>
</tr>
<tr>
<td>electricity suppliers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
NERA’s ‘Design of the Renewable Heat Incentive’ produced on behalf of DECC, explains that tariff proposals in the RHI consultation (outlined in chapter 2) have been designed to incorporate the potential incurred costs that could fall to a RES-H developer as a result of overcoming the barriers listed in Table 5. This implies that the policy proposal is intended to be used as a ‘bottom-up’ policy mechanism to breakdown the above barriers.

There has been little to no academic research into the effects that these non-financial barriers will have on the introduction of a revenue-based financial support mechanism (the RHI) in the UK. There has also been no research carried out (that is known and available to the author) on the capacity of the RHI to overcome the above barriers to RES-H development in the UK; in either a regionally or technologically specified area. There are multiple non-financial policies that have the ability to influence the effects of the above barriers on the successful development and operation of RES-H technologies. These non-financial policies are not the focus of this research, however see Appendix A and B for the RHI consultation, and subsequent information concerning the RHI’s interaction with other policies.

Whilst the RHI consultation has been designed to stimulate financial confidence in RES-H development and investment, it remains to be seen when the RHI is implemented whether the
policy is capable of overcoming any non-financial barriers to RES-H development and for this reason the beneficial impact of the RHI is not fully understood. Researching this area is a central aim and objective to this research; outlined in chapter 1.

Table 6 provides an insight into the ranking of the barriers presented in Table 5, in specific relation to biomass technology. Although the barriers presented are not as thorough as in Table 5, it is possible to understand that in relation to comparative RES-H technologies, the barriers that biomass RES-H face are historically more difficult to resolve. Appendix C presents a thorough profile of ranked biomass development barriers.

Table 6: Forecasted Difficulties in Overcoming non-financial RES-H Development Barriers (Enviros, 2008a, 2008b)

<table>
<thead>
<tr>
<th>Barrier Description</th>
<th>Biomass</th>
<th>Biogas</th>
<th>Solar thermal</th>
<th>GSHP</th>
<th>ASHP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inertia</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Awareness of renewable heat</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Difficulty of retrofit</td>
<td>High</td>
<td>High</td>
<td>Medium/ Low</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Hassle factor</td>
<td>High</td>
<td>High</td>
<td>Medium</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Consumer confidence (technology)</td>
<td>High</td>
<td>High</td>
<td>Low</td>
<td>Medium</td>
<td>Medium</td>
</tr>
<tr>
<td>Lack of skilled personnel</td>
<td>High</td>
<td>Medium</td>
<td>High</td>
<td>Medium</td>
<td>Medium</td>
</tr>
<tr>
<td>Resource constraints (fuel supply/ appropriate sites)</td>
<td>High</td>
<td>Medium</td>
<td>Low</td>
<td>Medium</td>
<td>Medium</td>
</tr>
<tr>
<td>Planning</td>
<td>Medium (AD)</td>
<td>Low</td>
<td>Low</td>
<td>Medium</td>
<td>Medium</td>
</tr>
</tbody>
</table>

In order for non-financial barriers to be addressed and for renewable heat to make a sizeable contribution to our renewable energy target, financing the solution to these barriers is crucial. As previously mentioned, NERA’s design of the RHI has taken into account the possible costs associated with RES-H development barriers through the proposed RHI tariff levels. However, it is interesting and important to acknowledge the potential costs of overcoming these barriers.

Figure 3.5.i illustrates the projected cost, against the beneficial impact of overcoming certain barriers to RES-H development. Barriers specific to wood-fueled biomass that have been detailed in Table 5 have been circled in red:
The range of barriers detailed in Figure 3.5.i predominantly has a ‘strong positive’ to ‘positive’ impact on RES-H development. However the costs of overcoming these barriers are wide-ranging. It is important to note that overcoming one barrier may make it easier to overcome another; it is also viable to suggest that the opposite may occur. For example, whilst overcoming the ‘installation capacity constraints’ has both a high impact, and is cost effective, without an increase in ‘competitive products in on-gas areas’ the feasibility of RES-H development may still be held back. Unfortunately there has again been no research (to the knowledge of the author) into the effects that overcoming one barrier may have on another. Despite this, it is vital that when considering a policy support mechanism to boost RES-H market growth, whether it is financial or non-financial, the mechanism must attempt to enable a holistic improvement of the barriers currently facing development.
3.6 Fuel Availability

Aside from Solar Thermal, RES-H technologies require a fuel or power source in order to operate. This is a major importance when considering the difference between RES-H and RES-E policy design. Within the context of the current study, when looking at sustained wood-fueled biomass technology development, the sustainability of wood-fuel source is extremely important.

The UK currently has no wood-fuel sustainability standards. (DECC Renewables Obligation Order, 2009) The Renewables Obligation Order 2009 requires large scale biomass generators to submit information to Ofgem detailing installation fuel source and usage, however as yet there is no standardised regulation surrounding and encouraging wood-fuel sustainability. (DECC, 2009f) The European Commission is aiming to report on the required criteria for labelling solid biomass ‘sustainable’, by 2011. (European Commission, 2009)

A recent report produced jointly by the Confederation of Forest Industries (ConFor) and the UK Forest Product Association (UKFPA) has brought the issues surrounding wood-fuel sustainability to the foreground of discussion:

Demand for wood fibre is forecast to increase dramatically in Britain in the next 15 years. The principal reasons behind this rise are Government policies and incentives which encourage the use of wood as a source of renewable energy. Resulting imbalances between potential availability and forecast demand are projected across the major wood fibre sources in Britain. Such developments could result in significant supply and price pressures which would have major consequences for existing wood processing industries and for the future shape of the biomass energy sector in Britain. (ConFor et.al, 2010)

This increased demand and supply potential is shown below in Figure 3.6.i. It is vital to state that the organisations involved in writing this report were aware of the RHI consultation and have not included forecasts of increased wood-fuel demand as a result of RHI funded biomass uptake into their analyses and stress tests of the sustainability of the wood-fuel market in the UK. (ConFor et.al, 2010)
According to the major wood-product and forestry management associations the UK wood fibre market will become increasingly reliant on imported stocks. The report continues to express concerns over importing wood sourced unsustainably as a result of increasing wood-fueled biomass capacity in the UK. (ConFor et.al, 2010) Interestingly this report also brings to light the importance of fuel source security in relation to a fuel that may become difficult to manage sustainably. This is because technology developers normatively desire the ability to secure long term wood fibre supply contracts covering 7 to 10 years or longer in order to win the necessary funding from banks and other financial backers to build and operate the plants. (NERA/AEA, 2009b)

In context to the South West, it is interesting to note that whilst Regen South West have been seeing great success in wood-fueled RES-H development in the South West, they are doubtful about the sustainability of this development due to a lack of understanding concerning wood-fuel availability, sustainability and price security. (Regen SW, 2008)

Conversely, Enviros’ research into the barriers faced by wood-fueled RES-H developers and suppliers states:

Even in the face of rising global demand for biomass fuels, although the cost of biomass may increase in response, it is not expected that the availability of fuels will in itself act as a constraint. Rather, the real barrier in terms of fuel availability is constraints on the fuel supply chain (i.e. the infrastructure to distribute the fuels) rather than on the availability of the resource itself. (Enviros, 2008a)
Whilst both sources agree that wood-fuel prices may rise and present themselves as a barrier to wood-fueled RES-H uptake, there is a debate over the extent to which wood-fuel availability may cause a significant problem to RES-H developers in the UK.

The Biomass Taskforce has historically believed that UK wood-fuel production capability has the potential to match demand in the UK market. (Biomass Task Force, 2005) However their stance is that this is only possible through a thorough actualisation of UK woodland management initiatives. DEFRA have long been aiming policies towards woodland development, in particular in order to generate revenue from unused woodlands. This activity has been supported by government grant funding. (Defra, 2005)

Research conducted by Poyry, Enviros, NERA, AEA, and the RES-H Project all elucidate the importance of wood-fuel for biomass technologies remaining highly competitive with the normative fossil based sources of fuel in order for organisations to benefit from, and be incentivised by the avoided costs associated with fuel switching to wood based RES-H systems. As stated in numerous reports, if wood-fuels become the subject of decreased security, sustainability or quality, whether the supply chain stems from the UK or abroad, the subsequent negative effect on a wood-fuel supply chain may result in a rapid decrease in RES-H development and forestry maintenance in the UK.

3.7 Call for Research

As this area has had very little academic attention there are several large gaps in the academic literature that may need to be understood in order for RH to contribute a significant proportion of UK RE targets.

This literature review has highlighted that there is a requirement to identify the extent to which financial policy support may need to occur in varying forms in order to actualise RES-H up-take in both domestic and non-domestic sectors. There is a need to qualitatively identify previous wood-fueled RES-H developer’s policy support preferences in light of the coming RHI.

The robustness of the wood-fuel supply chain in the South West must be understood as this will dramatically affect the projected outcome of the proposed RHI if implemented in April next year.
Technology specific barriers, within the context of the already established South West wood-fuel market, must be identified.
4 Methodology

This chapter will present the research method used within this thesis. The reasons for adopting this method and research design will be contextualised academically and subsequently applied to the current study.
4.1 Introduction to Research Methods

The literature review highlights the key areas of RES-H financial policy support that have been considered in academic and industrial literature, and grounds the thesis as important research when considering the conceptual capabilities of the RHI to help the UK to meet its RE generation targets.

Table 1.b: Aims and Objectives

1. Examine literature, both industry and academic, that discusses the various barriers, options and preferences for financial RES-H policy support.

2. Research and examine barriers to previous wood-fueled RES-H developments in the South West; both financial, and non-financial.

3. Research the effect that a revenue-based funding mechanism, i.e. the RHI, would have on barriers to South West wood-fueled RES-H development.

4. Highlight areas where future RES-H policy support may need to alter in order to fully actualise RH potential in the UK.

Moving forward now, through to the next aims and objectives, shown above in Table 1.b which is colour coordinated with Table 7, this research project has aimed to use the information presented in the literature review to justify the compilation of both a questionnaire and following this, a semi-structured interview involving previous South West RES-H developers.

4.2 Research Methods

Table 7 broadly presents a methodological critical pathway which correlates with this project’s A&Os. As Judith Bell states, this is a useful tool to present a coherent research methodology within the setting of a project’s A&Os. As Table 7 shows, the first research method utilised has been to construct a simple yet thorough questionnaire. The questionnaire consisted of 10 questions; all questions derived from the data produced in the previous literature review. Questionnaires are just one method of accumulating quantitative data. (Denscombe, 2007) Throughout the course of this research project it was decided that questionnaires where the most appropriate form of initial data analysis. The reasons for this came about from the
information provided in academic social science research guides produced by Denscombe, Creswell, Bell, and Flick. As the initial aim of the quantitative research was to answer A&O #2 (shown above in Table 1.b) it was necessary to involve as many potential recipients as possible. The afore mentioned social science research academics propose questionnaires to be the most efficient way of collecting quantitative data from a large sample of recipients. For this reason questionnaires were chosen to be the most advantageous method of quantitative data collection to this research project. The advantages of using quantitative data analysis within the context of this research project as defined by Denscombe (Denscombe, 2007) include:

**Scientific Advantages**

- Quantitative data lends itself to statistical analysis techniques. Importantly, ‘the results appear at least to be based on objective laws other than the values of the researcher’ (Denscombe, 2007)

**Measurement**

- Quantitative data results are based on a measured quantity, rather than a qualitative impressions

**Presentation**

- Quantitative data is easily placed into charts and graphs to provide clear and precise presentation of data sets.

**Confidence**

- Quantitative data gives any further research that is based on it additional credibility and scientific grounding.

**Analysis**

- Large volumes of quantitative data can be analysed quickly and results can be discussed within a small timeframe.

Table 7: Research Methods Pathway
There have however been certain negative consequences to this research resulting from using questionnaires to collect quantitative data, and they will be discussed further on in this chapter.

This research project has also employed the use of semi-structured interviews in order to gain a qualitative understanding of the answers available in regards to the project A&Os. Denscombe, Creswell, and Flick explain qualitative data as information that takes the form of words and images. (Flick, 2002; Creswell, 1994) Qualitative research methods include:

- Observation
- Document Interpretation
- Structured or Semi-structured Interviews
- Ethnography (collecting qualitative data whilst working within a project/organisation/group)
- Phenomenology (comparing observations of phenomenon to each other)

In light of the qualitative options available to the researcher, semi-structured interviews were chosen because of the freedom that is available to the researcher whilst carrying out the interview. Instead of having to stick to a rigid interview structure, where new and potentially crucial information may be shifted out of the conversation due to structured questions, a semi-structured approach to qualitative data collection seemed more appropriate. (Flick, 2002) A semi-structured interview has also been proven to ease data gathering in the field; in terms of a more human conversation making the human respondent more comfortable and therefore more at ease with delivering in-depth qualitative data. Also, a semi-structured approach to this process was well suited to the personality of the author. There have, as with the quantitative method of data collection utilised by this research project been negative consequences that have come about as a result of the chosen method of qualitative research.

### 4.3 Design of Quantitative Research

The questionnaire sent to recipients is attached to this paper as Appendix D. Alternatively, if you are viewing a digital copy of this paper the below link is attached to the on-line questionnaire.

http://www.surveymonkey.com/s/KZQPCFQ
The questionnaire was designed to expose and discover regularities within the recipient sample concerning;
- Percentage of RES-H developments that were grant funded,
- Barriers to previous RES-H development in the South West,
- Source of heating prior to RES-H implementation,
- General drivers for previous RES-H development,
- Extent of RHI awareness
- Stakeholder views on the RHI’s capabilities to overcome the barriers that they faced when implementing RES-H technology in the South West. (Heavily dependent on RHI awareness)

The questionnaire was internet based. An email was sent out to the owners/operators of all documented RES-H developments in the South West. Within this email was a link to the on-line questionnaire. The email acted as a notification of confidentiality; please see Appendix D for email and a hard copy of the on-line questionnaire.

It was crucial that the questionnaire was simple, well presented and easy to understand because many stakeholders would not have been familiar with the information provided in the literature review chapter of this research.

A pilot questionnaire was carried out by The Trelowarren Estate in Cornwall. The completion of the pilot questionnaire resulted in the simplification of the questionnaire layout and the phraseology of questions.

4.4 Design of Qualitative Research
The semi-structured interviews were informed by the information provided in the literature review. However, they were also grounded in the results produced by the questionnaire. As mentioned by Creswell in ‘Research Design; Qualitative and Quantitative Approaches’, this grounds the analysis of qualitative observations within the remit of quantitative data (produced in the project’s questionnaire), thereby enhancing the validity of the project’s qualitative design. (Creswell, 1994) Please see Appendix >>> for interview transcripts. The design of qualitative questions varied interview to interview. Question design depended on the knowledge of the interviewee in regards to:
- RES-H policy
- Finance options
- Infrastructure requirements
- Development barriers outlined in literature review and highlighted from previous interviews.

A key strength to the design of the interviews was that they were able to adapt to interview circumstances and information availability.

4.5 Sampling Recipients/Interviewees

The aim of this research was to questionnaire every known RES-H development in the South West. There is not a central source of information available that exists as a resource for documenting all known RES-H developments in the UK. Sampling of previous RES-H developments in the South West was facilitated through the Renewable Energy Association’s (REA) website and, through Regen South West’s online documentation of known wood-fueled RES-H developments in the South West. Figure 4.4.i shows the sample region, and Figure 4.4.ii shows Regen South West’s on-line interactive map.

![Figure 4.4.i: Regen SW Bioheat Map](RegenSW, 2010)

![Figure 4.4.ii: Research Sample Region](RegenSW, 2010)

Potential recipients were sent the email containing the questionnaire and confidentiality statement. Prior to this the questionnaires were followed up with telephone conversations, introducing the project, and questioning the completed response of the questionnaire.

Overall 94 RES-H developments were located to have been developed in the South West. Within the questionnaire recipients were able to nominate themselves for semi-structured interviews. Of the 94 RES-H developers, 14 respondents replied to the questionnaire and 12
nominated themselves for further project involvement through the interview process. Of the 12 interview confirmations, 6 were selected; 2 domestic, 2 commercial, and 2 large scale/industrial. Interviews were designed in this way to ensure a holistic understanding of the potential barriers that the RHI will face with regards to past wood-fueled biomass development in the South West. A final interview was conducted with the RHI Policy Development Manager at DECC. During this interview both quantitative and qualitative data (after analysis) formed the outline of a face-to-face semi-structured interview in an attempt to provide an overview to the implications of the identified barriers and development issues' effect on the future success of the RHI.

4.6 Data Collection and Confidentiality
The majority of interviews were conducted over the phone, thorough Skype. The interview with DECC was, as mentioned previously, face-to-face. For the stakeholder interviews, telephone conversations were recorded digitally whilst in process. The questionnaire respondents and interviewees names and details were only included into the research if they specifically stated that they had no objection to this happening. After the submission of the thesis, all personal information was deleted.

4.7 Inherent Weaknesses of Research Methods
Whilst the research and analysis conducted has attempted to be as objective as possible, it is important to state the background of the researcher as to present any personal bias that may or may not have affected research outcomes. (Creswell, 1994) This research has stemmed from a one year MSc course in Energy Policy and Sustainability. For this reason it is essential to make aware to the reader, a belief inherent to the researcher of the importance of sustainable and renewable development.

The questionnaire did not promote as many respondents as was initially desired. As previously stated, an email questionnaire, as defined by Denscombe, was utilised. As Denscombe explains, and as has been seen through this research, there are two major disadvantages to using this type of questionnaire. Firstly, there is a significant risk that the questionnaire will not be completed fully or at all, and secondly that the questionnaire, by its very nature has to be very basic in order to continue a respondents attention span for as long as possible. (Denscombe, 2007) The relatively low response rate to the questionnaire has meant that the results that it provided do not portray as holistic an understanding as was hoped for.
Flick states in ‘An Introduction to Qualitative Research’, “The main problem [with semi-structured interviews] is how far the interviewer manages to make the procedure plausible to his or her partner...and deals with irritations which may be caused by irritating questions’ (Flick, 2002) This was definitely experienced in the interview process, as information can be held back by the interviewee depending on the phraseology of the question posed. Another major weakness discovered with the chosen method of qualitative research was the difficulty that semi-structured interviews present to the researcher when the time comes to analyse the data, and use it in academic discussion. Answers, are subjective, and so too is the analysis of the researcher. It is plausible that, as the interviewee states one thing, they are alluding to information that the researcher has not been informed about, thereby compromising the precision of the data collected.

4.8 Analysis of Data
Data collected from the email questionnaire was complied into various bar charts and a Likert scale; ranking respondent response strengths. Questionnaire nominal data sets were compared in order to ascertain whether patterns emerged across the recipient sample. Mid-points were identified. (Denscombe, 2007) Qualitative data analysis began with the transcription of the semi-structured interviews. To ‘avoid introducing unwarranted preconceptions’ (Denscombe, 2007) into qualitative results, trends were drawn from the data sets which corresponded with, and were backed-up with, quantitative results. Each interview produced central themes as a result of the interview questions. These themes were cross-examined with other interviews to compile a series of ‘key’ themes to be discussed in the following ‘Results and Discussion’ chapter.
5 Results and Discussion
This section presents the key research outcomes from the research methods outlined in the previous chapter. Many issues surrounding barriers to RES-H development were raised through project fieldwork; within the remit of this project it has been necessary to focus on the most frequently discussed themes.
5.1 **Questionnaire Results**

*The full results of the questionnaire are available in Appendix D*

The main research findings from the questionnaire were as follows:

- The main driver for RES-H development in the South West sample group is ‘the desire to consume energy more sustainably.’
- 92.9% of respondents used a grant mechanism to fund or part-fund the implementation of a wood-fueled biomass boiler.
- 53.8% of respondents are aware of the RHI.
- The main barriers to wood-fueled RES-H development in the South West sample group have been; a shortage of skilled professionals, system design problems & the availability of wood fuel, and wood-fuel suppliers.
- The majority of stakeholders aware of the RHI believed that barriers ‘availability of wood fuel/fuel suppliers’ and ‘underdeveloped renewable heat market structure’, could be overcome by the RHI.

As these areas were identified in the questionnaire they became the basis of interview questions and discussions.
5.2 Benefits of RES-H Development

The questionnaire has identified that the main driver for RES-H development from the respondent sample was ‘the desire to consume energy more sustainably’. This is shown below in Figure 5.2

<table>
<thead>
<tr>
<th>Reason</th>
<th>Response Percent</th>
<th>Response Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost benefit of fuel switch</td>
<td>42.8%</td>
<td>6</td>
</tr>
<tr>
<td>Aim to capitalise on a Grant Mechanism</td>
<td>14.3%</td>
<td>2</td>
</tr>
<tr>
<td>Desire to consume energy more sustainably</td>
<td>92.9%</td>
<td>13</td>
</tr>
<tr>
<td>An aim to increase energy security</td>
<td>28.8%</td>
<td>4</td>
</tr>
<tr>
<td>Desire to produce heat energy locally</td>
<td>35.7%</td>
<td>5</td>
</tr>
<tr>
<td>To promote South West businesses through supporting local wood-fuel supply chains</td>
<td>0.0%</td>
<td>0</td>
</tr>
<tr>
<td>Aiming to generate a green unique selling point for your company/product</td>
<td>28.8%</td>
<td>4</td>
</tr>
</tbody>
</table>

Figure 5.2: Questionnaire Results – Drive to Implement RES-H

The first question asked to the selected interviewees was ‘how has your wood-fueled RES-H technology benefitted you/your organisation’. The responses were positive across the board except for one installation, at Ecozone, for reasons that will be identified later on in this chapter.

On a domestic level, one interviewee responded to the above question by explaining that:

*What renewable heat has meant for us is that we now can afford to heat our entire home, not just the living room with a sustainable source of heat...moving from an almost unaffordable source of heat [oil] to wood has had huge benefits for us, in particular health benefits over the winter period.*

When considering the important government target of eliminating fuel poverty by 2016 it is suggestible that RES-H technologies may have a large part to play in the future when dealing with this issue. (ECCC, 2010)
Every interviewee’s source of heat prior to RES-H implementation was heavily, and in some cases wholly reliant on oil. Both domestic and non-domestic interviewees reported huge financial benefits due to the avoided cost associated with moving from a very expensive and volatile FF to a much cheaper wood-based fuel source.

Ecological benefits of wood-fuel use have also been identified through qualitative research. The interview with the National Trust has explained the use of wood-fueled RES-H development as;

[A] catalyst for increasing our work in woodland management...which has seen us doing some really important work in areas of woodland that we otherwise had no incentive to spend money on regenerating

This regeneration has also, through this research, been seen on a domestic level, as an interviewee explained that the avoided costs has meant that they can now spend money on employing a local arboriculturalist to regenerate an ancient coppice which until the installation of their boiler, had been sitting unused.

5.3 Policy Accessibility

92.9% of RES-H developments in the South West that responded to the questionnaire have used some form of government funded grant support to pay for the capital cost and installation of their wood-fueled biomass boiler, shown below in Figure 5.3

<table>
<thead>
<tr>
<th>1. Was the capital cost of your organization/business/person’s wood-fueled renewable heat capacity financed by a grant-based funding mechanism?</th>
<th>Response Percent</th>
<th>Response Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>92.9%</td>
<td>13</td>
</tr>
<tr>
<td>No</td>
<td>7.1%</td>
<td>1</td>
</tr>
<tr>
<td>Do not know</td>
<td>0.0%</td>
<td>0</td>
</tr>
</tbody>
</table>

Figure 5.3: Questionnaire Results – Grant Funding

However, the range of experiences that interviewed participants have had with grant-based funding has been wide ranging. This research has found that domestic early movers have found acquiring and using grant funding more difficult than both commercial/industrial
stakeholders. This result does not contradict domestic preferences for grant support over any other form of support produced in the Literature Review chapter, however it does demonstrate the importance of providing a policy support mechanism that is both easy to access and easy to understand for domestic RES-H developers.

Both interviews conducted with small scale domestic installations expressed angst at the lengthy administration process associated with grant funding mechanisms. Both interviewees explained that the complicated nature of the grants that they required delayed their ability to install wood-fueled boilers; in one case for over a year. Once the grants that they had applied for were eventually processed both domestic installations found that only received a fraction of the initially agreed capital; one domestic client of the grant system described the process as ‘byzantine and inevitably not worth our while’ (Riggleford, 2010). Commercial and industrial interviewees found grant financing easy to access and uncomplicated to understand. After interviewing both the NHS and the National Trust, it was made clear that both organisations used grant funding to finance over 35% of project costs.

This research has found that commercial and industrial RES-H developers have found past RES-H financial policy support mechanisms easier to interact with and understand than small-scale domestic developers. The medium to large scale interviewees made clear that this is due to the fact that commercial/industrial stakeholders have had the expertise and man-power available to push through the policy application process. It is clear that RES-H financial policy support has historically suffered from a lengthy administration process.

The complicated and timely interaction of previous policy support mechanisms for the domestic sector is of crucial importance when considering the RHI as the only policy support mechanism available for future RES-H development. Myc Riggleford, a small-scale wood-fuel biomass operator states, when responding to the question:

Q: If you were to install a RES-H technology again do you think the RHI could have the potential to fix/overcome/change any of your problems? [the interviewee had read the RHI consultation]

In general, no. I think it has the potential to incentivise large corporations to put in RH into new build factories and retrofit for instance. But I don’t think it offers anything realistic in terms of allowing individuals to easily access the system, or to make meaningful decisions about what they should put in because the average individual cannot possibly balance one form of RE generation against another until they have used them already.

Erich Scherer, the RHI Policy Development Manager at DECC acknowledges that ‘grants have typically suffered from some major downsides’, however goes on to state that one of the main
focuses of the RHI’s design has been to construct a policy that is easy to interact with, no matter what scale/capacity of installation future stakeholders are looking to develop. (Scherer, 2010) Inevitably, as the RHI is still under consultation it remains to be seen whether the RHI’s administration efficiency and attempted simplicity of design will halt a repeat of past frustrations in the domestic sector. However, as Rigglesford quite rightly states, if a homeowner does wish to install their own RES-H technology in the future under the RHI, it may be necessary for the RHI, or a separate policy, to be designed to inform the party concerned over which RES-H technology would best suit their property and location. In this sense, end-user policy education (on a domestic scale) may need to be improved.

5.4 Skilled Professionals and System Design

The questionnaire respondents highlighted ‘a shortage of skilled installation professionals’ and ‘system design’ as ‘vital’ barriers on the Likert scale.

As a consequence of this the interviewees were questioned about both of these issues. The results of the interviews showed how both development barriers interlinked. Whilst MCS accredited installers were difficult for domestic owner/operators to acquire, commercial and industrial RES-H developers suffered from a lack of communication between MCS accredited installers (where more than one MCS installer was involved in the project); resulting in a lack of operational support for the commercial/industrial developer and overall, a poorly designed RES-H system.

This lack of support post-installation may be in part due to the grant system that was in place. A revenue-based financial support mechanism, where continued maintenance of the boiler is obligatory, such as the RHI, is believed by the interviewees to potentially incentivise increased MCS accredited professionals and increase communication between installers and operators post-installation, therefore resulting in a reduction in system design associated problems.

On a domestic level, it appears that small-scale experiences with the availability of MCS accredited installers have been a negative one. With one domestic interviewee stating that ‘an MCS accredited installer was very difficult to find and in the end the MCS accredited installer that we used travelled from the north of the county....we did not like the fact that we could not source an MCS accredited installer locally’ (Domestic Interviewee #2, 2010) This shows a lack of MCS accredited installers in the South West at the time of the interviewee’s RES-H installation.
Whilst this does not provide a conclusive insight into the availability of MCS accredited installers in the South West, it does reveal an important and positive desire of domestic RES-H developers to source RES-H associated trade skills as locally as possible.

A firm example of a lack of communication between installers of RES-H technology and the operators of the technology is exemplified in the interview with Ecozone. Ecozone are a registered pro-environmental charity who rent out a building to various ‘eco-show’ events throughout the year; they were selected as a ‘commercial’ interview participant. A 220kw wood-fueled biomass boiler is available to the customers of the building throughout the year. When asked what the motivation for installing the boiler was, they answered;

‘it was done because the grant money was there, however the follow up on it has not been maintained, the company that installed it also accessed some form of grant funding, and now that it has come to maintaining the system and using it effectively it is just not followed up on’

The previous grant support system, which provided only up-front capital, has meant that Ecozone are now left with no financial incentive to continue to maintain and use their biomass boiler other than the economic advantage of supplying their customers with cheaper heating powered by wood-fuel. However, as Ecozone stated this problem is exacerbated by their customer’s unwillingness to choose the biomass boilers as their heating supply due to a lack of confidence in the system. This lack of confidence stems primarily from Ecozone’s lack of knowledge about how to use the system effectively, which is in turn a result of poor communication between installer and operator concerning the system design (Ecozone, 2010). Interestingly Ecozone’s answer to the following question is as follows:

Q: What effect do you think that an RHI style policy incentive would have had on your development?

We would insist that our clients used the biomass boiler if it had the RHI attached to it because the showground would then be making a profit and would be paying off the costs of the installation and would make it viable from our perspective to use that and probable as a result would end up with it being supported more on-site, and advertised more.

Whilst Ecozone have had no problems with getting hold of MCS accredited installers, it seems that the continued support from these installers has been very minimal. As shown above, the RHI, whilst not directly providing a financial solution to the non-financial MCS barrier, may stimulate a market whereby MCS installers have a vested interest in the up-keep of the technology as the owner/operator needs to maintain the technology in order to acquire continued government financial support (for more depth see Appendix A). This may overcome
similar problems in the future, tackling both longevity of technology support and providing a higher initial standard of system design.

The issues surrounding MCS accreditation and system design were presented to Erich Scherer in the conclusive interview with DECC. Scherer stated:

"It is quite clear that some aspects of MCS accreditation are not sufficiently mature, inclusive of the high costs of accreditation and these factors could arguably be seen as barriers to uptake...but on the other hand it is important to provide a sufficient level of comfort to consumers, especially on the domestic scale as it has been accompanied by a lot of bad press...Weighing up that balance is very difficult. One part of the story would certainly be to look at how MCS can be improved...but that is not something that happens over night."

As Scherer clearly states, certain issues surrounding the quality and quantity of MCS accredited installers in relation to RES-H technology uptake may indeed need to be resolved and perhaps more government spending/support needs to occur in this area. However if the RHI is implemented in April next year then, as this research shows, the issues surrounding effective communication of system design may be resolved by the policy pressure of needing to continue to operate a system in order to access the RHI revenue stream.

5.5 Wood-Fuel

The availability of a reliable and sustainable source of wood-fuel was a key concern of all owner/operators of wood-fuelled RES-H technologies interviewed. The general consensus was that fuel security, sustainability and price security are serious concerns in the South West market. All owner/operators agreed that these issues were a concern prior to fuel switching from a FF supply chain; however they also agreed that these issues are more volatile in the South West wood-fuel market.

Both small-scale domestic developments that were interviewed commented that they have seen their fuel prices rise significantly since the initial implementation of RES-H. They both, when questioned, stated that they were concerned that if the prices continue to rise many people will simply not invest in the technology, as they believed that a major driver to fuel switching is the associated avoided cost. One interviewee commented that they would not want to be burning imported wood-fuel. This attitude may have negative implications for domestic wood-fuel RES-H uptake when contextualising this attitude within the information provided in chapter 3.6. One domestic interviewee complained, extensively, about the lack of
government support available for the regeneration of an ancient coppice which is within the legal ownership of his land. Despite attempting to access DEFRA’s ‘Woodland Grant Scheme’, DEFRA have, according to the interviewee, not responded to his requests for capital support, and feels strongly that the support system is geared towards large scale wood-fuel production, and not local small-scale regeneration.

The NHS has had the benefit of securing a medium to long term supply contract with a South West based wood-fuel supplier. However, when interviewed they demonstrated concerns over the possibility of securing such a contract again, even under the RHI, as they do not have confidence that the RHI has the capability to incentivise the large scale wood-fuel price competition that they believe would be required to bring wood-fuel prices down. The NHS was ‘fairly unconcerned’ about the implications of burning imported and potentially unsustainable wood-fuels.

Ecozone stated that it was extremely difficult for them to locate a wood-fuel supplier in the South West that was affordable and delivered regularly enough to meet their system design. However this may be an example of how crucial system design is for the success of wood-fuelled RES-H. Without adequate storage capacity an installation can not make use of economies of scale; critical for ensuring a reliable and affordable fuel supply chain. This is of particular importance for the non-domestic sector.

The National Trust is an exception to the rule. They ‘have access to a huge amount of [wood-fuel] potential on [their] grounds.... and are looking at developing [their] own national wood-fuel supply chain’ (The National Trust, 2010) The National Trust continue to state; ‘we think that our potential to produce may even amount to a National Trust brand of wood-fuel that we could supply to many installations outside of the Trust’s ownership’ (The National Trust, 2010)

As this issue had been highlighted by South West stakeholders it was produced to Erich Scherer. He explained that when thinking about RES-H policy design, in the case of fuel supply chain issues such as those documented in this research, some very difficult decisions have to be made. Scherer explains that when designing the grandfathering of tariff levels the volatility of fuel prices plays a significant role; ‘it raises another question that we also addressed in the consultation document, which is how, if at all, tariff levels should respond to fluctuations in fuel prices’ (DECC, 2010). Scherer continues to state that:
[A] predictable, certain and simple tariff scheme is one that is set at the beginning of the project and will hopefully not change, but that means that tariffs would not be able to change. Whereas on the other hand you could argue for a tariff that might fluctuate in response to those kinds of price changes but in the absence if a single price for wood-fuel traded on some sort of exchange….its actually quite difficult to determine in a predictable way how your tariff would fluctuate

This research agrees with Scherer that effectively grandfathering a revenue-based policy which has a potentially volatile fuel supply chain is tricky, and it remains to be seen how the RHI, if implemented will address this issue. However, it is the opinion of this research that more may need to be done by the government in terms of incentivising UK wood-fuel production. Whilst the RHI may increase market competition, without increased end-user confidence in wood-fuel as a sustainable, secure and readily available product, the up-take of solid wood-fuel biomass may be compromised.

5.6 Capital Finance

Throughout the course of the semi-structured interviews it became consistently clear that many stakeholders were concerned over the lack of capital finance that the proposed RHI will provide. Despite frequent grumbles over the lack of accessibility provided by the previous grant system, all interviewed RES-H developers, on all scales, expressed concerns regarding the loss of capital finance that would occur as a result of the RHI becoming the main RES-H financial support mechanism. However as will be seen, RES-H owner/operators who are looking to their next RES-H project are looking to invest in, and are passionate for some innovative solutions to the problems facing the loss of RES-H capital finance.

Two horticultural nurseries were interviewed; both having installed medium scale (<250kw) boilers. The response that was received from these companies when questioned about their views over the impact that they believe they would have felt if hypothetically developing RES-H under the RHI were very similar. Both companies used the term ‘not cash rich’ in their retrospective analysis of their initial outlay of RES-H development. They felt that without some form of capital finance support they would not have been able to confidently develop a wood-fuel RES-H system. (Horticulture #1, 2010; Nusery #1, 2010) It is important to note that this example is limited in that the companies are very similar and are not a solid representation of the entire market.

However this response was also echoed by the domestic interviewees. One domestic sector interviewee was unable to comment on the issue due to a lack of understanding. The other
however called for, as previously mentioned, a much more accessible and comprehensible grant system, but importantly one that is only available to small-scale domestic development. His concern was over ‘increasing fuel prices passing on to the fuel poor because of a massive up-take of the RHI in the commercial and industrial sectors.’ (Riggsford, 2010)

The energy manager at the Truro Hospital Cornwall was interviewed. Truro hospital have a large (>250Kw) wood-fueled biomass boiler installed on site. The energy manager interviewed was central to the implementation of the technology. Interestingly, the system design barriers that the NHS have faced during the installation of the biomass boiler have meant that the governors of the Trust are now highly unsupportive of future RES-H development due to the high capital costs associated with RES-H development in comparison with conventional FF sources of heat. (NHS, 2010) Whilst this is unfortunate, the NHS are now looking to the RHI to provide the basis of a revenue stream that can support the development of an Energy Services Company (ESCO) to oversee the installation, generate a medium term wood-fuel supply contract, and operate and maintain future wood-fueled RES-H applications. It appeared, through the information provided in the interview that the NHS is not aware of any ESCOs in the South West that can currently deliver such a development package. However this is unsurprising as such an ESCO would be looking to profit from government grandfathered revenue streams, such as the RHI.

A similar response to the NHS came from the National Trust; who also, like hospitals have to report to a board of trustees to deliver finance to requested project proposals. The National Trust stated that not having the previous grant system in place would not necessarily present (for them) a barrier to future RES-H development:

 As we are a charity and have limited capital clout it is very important to us that we can provide a thorough financial feasibility study to the board....as the Trust now recognise that these technologies have a huge potential through both avoided cost for us, and for the environment....we believe that the RHI will strengthen the possibility of us to present a consistently financed project to the board and ultimately get it approved

It appears that even though both large-scale developers that were interviewed have different relationships with their governing boards, they are both looking to the RHI to provide revenue support in the future and have little concern about the capital financing involved with future developments. On the other hand this research has found that small to medium scale developers are concerned about the implications of a loss in capital grant support on the initial outlay of a RES-H development. Ecozone, who are now looking at developing another biomass
boiler, have stated that ‘without a low interest loan, perhaps from a government source, we would seriously consider investing in the technology again’ (Ecozone, 2010)

These research findings were also presented to DECC. When asked about the concerns voiced from previous and future RES-H developers, the outcomes of the discussion were very interesting. Scherer states;

‘my first reaction to that is that it is fairly irrelevant in terms of the outcome….if ESCOs are the means by which the market delivers…then so be it…if you are talking about up-front vs. revenues based then it is a more delicate issue’

Scherer was asked to expand on this ‘delicate issue’, and he stated:

‘where we have been traditionally, is that if you are able to provide long term certainty then doing it in a revenue based way does encourage the long-term use of the equipment…and the long-term certainty of the scheme should allow the commercial market to come up with financial packages that should, where necessary turn those into front loaded payments’

This research predominantly agrees with Scherer. When asked to further comment on the possible options for providing and encouraging third party financial support to tackle the loss of capital finance, Scherer mentioned the new Government’s ‘Green Deal’, outlined in the Conservative Party’s manifesto. He believed that this could provide capital support to small-scale developments that may, as this research suggests be required. Scherer also mentions the potential future role of Local Authorities (LAs) for delivering and project managing RES-H in order to combat fuel poverty as they have the access to social housing development that private firms like ESCOs, may not. Scherer clarifies the political uncertainty around this issue by making the statement that ‘there are not currently any policy proposals for front-loading [renewable heating policy support]’ (Scherer, 2010). However, a form of front-loading may be required in order for small scale domestic RES-H to occur. Whether this front-loading occurs through government administered soft loans, grant support or just a restructuring of the RHI to provide front-loaded support is not the main aim of this research. It does however appear that there may be a real need for front-loading of some sort to be considered by any future RES-H policy support mechanism.

5.6.1 Summary

It is possible to ascertain from both the literature and the research carried out by this project that the RHI has been designed to accommodate non-domestic RES-H development more than in the domestic sector. As this research shows, the non-domestic sector does seem to be a lot

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less anxious about its ability to adapt to the financial policy support shift that the RES-H market is currently seeing. This process of market targeting is called ‘cherry-picking’. These thoughts were presented to the RHI Policy Development Manager, and his reply was as follows;

Q: Do you think that it is viable to suggest that the RHI has been designed to ‘pick the lowest hanging fruit’ first?

A: It is firstly important to state that this is a controversial term….I guess you mean the easiest to install; so you would also mean the cheapest to install (see market potential section of literature review)....if you try and incentivise this then you can encourage a ‘wait and see’ behaviour and the perverse incentive, we do not want this to happen....

Scherer states the importance of defining accurately what is meant by ‘lowest hanging fruit’, and continues to explain;

The RHI has been designed to provide a relatively comprehensive set of tariff levels across the board....we also have some very ambitious targets to meet.....there are in a way of course lowest hanging fruit which is typically larger scale more cost effective projects....our modelling certainly suggests that by-far the greatest part of delivery of the RHI would have to come from the large scale sector

This is not to suggest that the RHI has been designed in favour of large-scale projects, but that as a government department, DECC’s number one priority is to potentially use the proposed RHI to help meet very ambitious government RE generation targets. The extent to which the small to medium scale front-loading which may be needed will occur is however yet to be seen.
6 Conclusion

Table 1.c: Aims and Objectives

1. Examine literature, both industry and academic, that discusses the various barriers, options and preferences for financial RES-H policy support.

2. Research and examine barriers to previous wood-fueled RES-H developments in the South West; both financial, and non-financial.

3. Research the effect that a revenue-based funding mechanism, i.e. the RHI, would have on barriers to South West wood-fueled RES-H development.

4. Highlight areas where future RES-H policy support may need to alter in order to fully actualise RH potential in the UK.

The Literature Review section of this thesis has attempted to answer A&O.1 (shown above). It made clear that the future availability of a sustained source of wood-fuel for biomass applications is a contentious issue. Stakeholder policy support preferences vary dependent on generation scale. It highlighted RES-H development methods in the EU, presented the known barriers to RES-H development in the UK and discussed UK wood-fueled RES-H market potential.

The findings from A&O.1 were used to answer A&O.2. This research has found that wood-fuel sustainability is a major concern in the South West. System design issues have been crucial to the success of South West RES-H development. Interestingly, the previous grant support mechanisms in place have in themselves been identified by this research to have been a contributing factor to many RES-H development barriers in the South West.

The potential of the RHI to overcome RES-H development barriers in the South West wood-fueled RES-H market is yet to be seen. However, this research has identified four key areas were the RHI and government initiatives must provide improvement. These are: MCS accreditation, policy accessibility, wood-fuel availability (security and sustainability), and issues around capital financing on a domestic scale.
It is the opinion of this research that whilst the RHI has the potential to greatly increase RES-H implementation and investment in the non-domestic sphere, the government may want to consider ways in which it can support and incentivise capital financing solutions for domestic-scale installations. This research has shown that this may occur naturally in the market, through ESCO setups and other third party investment opportunities. However it is the opinion of this research project that if the government is serious in its statements in the RHI consultation document about the RHI’s capacity to apply to all scales of generation, then it may need to re-consider how best to provide capital finance solutions to the domestic sector. This can be achieved through a more front-loaded design of the RHI, through targeted soft loans or a domestic-only grant system.

There are many barriers to RES-H development in the South West, however this is expected from a young and innovative market. It is also an understanding of this research that there is no such thing as a perfect policy. However the future of renewable heat policy in the UK must understand, holistically, the issues facing increased RES-H development, and design policy accordingly. Adding to this understanding has been the main objective of this project.
7 Further Research

Key areas for further research that have been identified through this research project are identified below:

- An assessment of third party financial investment options for the South West (or UK) RES-H market, under the proposed RHI.

- An analysis of ESCOs and their ability to alleviate fuel poverty through the proposed RHI.

- A resource assessment of wood-fuel potential in the UK, and the upper limit of wood-fueled heat generation possible with UK produced wood-fuel as the primary fuel source.

- Research into the most user-friendly wood-fueled RES-H system design.

- An identification of gaps and bottle necks in the South West wood-fuel supply chain.

- Research the potential role of Local Authorities in delivering RES-H technologies on a domestic/small-scale level.

- Case study analysis of EU district heating project development models and their capacity to apply to the UK.
8 References


European Commission (2009) *EU Action Against Climate Change: Leading Global Action Against Climate Change and Beyond*. 

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NERA (2009b) Scenarios for Renewable Heat Supply Capacity Growth to 2020
http://www.decc.gov.uk/assets/decc/What%20we%20do/UK%20energy%20supply/En
ergy%20mix/Renewable%20energy/policy/renewableheat/1_20090724115050_e_@


Microgeneration Certification Scheme (2010) website:


http://www.southwestwoodshed.co.uk/static/?page_id=98 (Regen SW, Exeter) 


Woodfuel Heat Renewable Energy Association (REA), 2010

9 Appendix
Appendix A
The RHI Consultation

http://www.decc.gov.uk/assets/decc/Consultations/RHI/1_20100204094844_e_@@_ConsultationonRenewableHeatIncentive.pdf
Appendix B
RHI Consultation Questions
RHI Consultation Questions

Q1: Are there any issues relevant to the design or operation of the RHI that are not addressed in this consultation document? If so, how should we deal with them?

Q2: Do you see any barriers to such financing schemes coming forward? In particular, are there any limitations in leasing and finance legislation that you feel inappropriately restrict the development of RHI financing models?

Q3: Do you agree with our proposed RHI registration and payment approach? If not, can you suggest how this approach can be improved?

Q4: Do you agree with our approach of requiring products and installers for installations up to 45kW within RHI to be accredited under MCS or equivalent?

Q5: Where MCS is extended beyond the current limit, do you agree that we should require the use of MCS certified installers and equipment for eligibility for the RHI?

Q6: Can you provide details of any UK or European standards that should count as equivalent to MCS? How should we recognise these standards for the RHI?

Q7: Do you agree with our proposed approach to eligibility of energy sources, technologies and sites?

Q8: Do you agree with our proposed approach on bioliquids? Are you aware of bioliquids other than FAME that could be used in converted domestic heating oil boilers? If so, should we make them eligible for RHI support, and how could we assess the renewable proportion of such fuels to ensure RHI is only paid for the renewable content of fuels?

Q9: Do you agree with the proposed emissions standards for biomass boilers below 20MW? If not, why, and do you have any evidence supporting different ones, in particular on how they safeguard air quality?

Q10: Do you think the RHI should be structured to encourage energy efficiency through the tariff structure (in particular the use of deeming), or, additionally, require householders to install minimum energy efficiency standards as a condition for benefiting from RHI support?

Q11: Can you provide suggestions for how to ensure that developers do not build to lower energy efficiency standards as a result of the RHI in advance of 2013 and 2016 building regulations taking effect?

Q12: Do you agree with our proposals on where we should meter and where we should deem to determine an installation’s entitlement to RHI compensation?

Q13: Do you agree that a process based on SAP or SBEM for existing buildings or the Energy Performance Certificate for new buildings is the best way of implementing
deeming? Do you have any suggestions on the details of how this assessment process should work?

Q14: Do you agree that at the large scale/in process heating, where we propose metering, the risk of metering resulting in a perverse incentive to overgenerate is low? How could we reduce it further within the constraints of using metering, to ensure only useful heat is compensated? Do you see any practical difficulties concerning use of heat meters (such as on availability, reliability or cost of heat meters) and, if so, how should we address them?

Q15: What is the right incentive level required to bring forward renewable heat from large-scale biomass including in the form of CHP while minimizing costs to consumers?

Q16: What is the right incentive level required to bring forward renewable heat from biogas combustion above 200 kW including in the form of CHP while minimizing costs to consumers? Do you have any data or evidence supporting your view?

Q17: Do you have any data or evidence on the costs of air source heat pumps above 350 kW or solar thermal above 100 kW?

Q18: Do you agree with the proposed approach to setting the RHI tariffs, including tariff structure and rates of return? Do you agree with the resulting tariff levels and lifetimes? If not, what alternatives would you prefer, and on the basis of what evidence?

Q19: Do you agree with our proposed approach on mixed fuels? Do you agree with our proposal that, at larger sites, with the exception of EfW, RHI will require the use of a dedicated boiler for the renewable fuel? Where our approach is to follow the Renewables Obligation, do any aspects need to be adapted to account for the different situation of renewable heat?

Q20: Do you believe that we should provide an uplift for renewable district heating?

Q21: Do you believe that an uplift should be available to all eligible district heating networks, or that eligibility should be determined on a case-by-case basis depending on whether a network contributes to the objective of connecting hard-to-treat properties (and, if the latter, how should we determine this for each case)? Do you agree that situations of one or a small number of large external heat users should not be eligible for an uplift, and, if so, what should be the minimum eligibility requirement for an uplift (expressed for instance as a minimum number of external customers)?

Q22: Do you agree that RHI tariffs should be fully fixed (other than to correct for inflation) for the duration of any project’s entitlement to RHI support? Do you agree that we should include bio-energy tariffs, including the fuel part of those tariffs, in such a grandfathering commitment?
Q23: Do you agree with our proposal not to introduce degression from the outset of the scheme but consider the case at the first review?

Q24: Do you agree with our proposed approach on innovative and emerging technologies?

Q25: Do you have any views on how we should encourage technology cost reductions through the RHI, particularly on solar thermal heat?

Q26: Do you agree with our proposed approach to reviews, and the timing and scope of the initial review?

Q27: Can you provide examples of situations that could be taken into consideration in determining criteria for an emergency review?

Q28: Do you agree with our proposed approach to allow access to RHI support to new projects where installation completed after 15 July 2009, but not before? Do you have any evidence showing that in particular situations RHI support for installations existing before this date would be needed and justifiable?

Q29: Are there any parts of the proposals set out in this consultation that in your view would allow for unacceptable abuse of RHI support, or other unintended consequences? If so, how could we tighten the rules while keeping the scheme workable, and avoiding an overly high administrative burden?
Appendix C
Enviros, Barriers to RES-H Development
## Biomass

<table>
<thead>
<tr>
<th>Barrier name</th>
<th>Description of barrier</th>
<th>Rank</th>
<th>Impact on other barriers: What and how?</th>
</tr>
</thead>
<tbody>
<tr>
<td>High space requirements (all modes)</td>
<td>Larger equipment in comparison to conventional heating systems might discourage customers. Arguably this barrier is less likely to bite where end users are already more used to storing heating fuel e.g., where they are off the gas grid.</td>
<td>Medium</td>
<td>X √ √ √ x X X X n/a</td>
</tr>
<tr>
<td>Transportation (all modes)</td>
<td>Concern over fuel transportation requirements may restrict the levels of deployment in densely populated areas where congestion is already an issue. E.g., domestic customers may not consider biomass a viable option particularly if they have previously used gas. Restrictions of vehicle movements set out in planning permission for some sites might prevent projects from proceeding. Some sites might also have problems in terms of accessibility by lorries.</td>
<td>Low</td>
<td>X √ √ √ X √ √ May have an impact on planning permission.</td>
</tr>
<tr>
<td>Geographic coverage - travel requirements (all modes)</td>
<td>Customers prefer local suppliers which are accessible.</td>
<td>Low</td>
<td>√ √ √ X √ √ X √</td>
</tr>
<tr>
<td>Difficulties with installing infrastructure (Approaches requiring DH)</td>
<td>Particularly in cities most of the space is already used by other pipes and cables. It is difficult to retrofit DH network to cities. It is also challenging to interlink different DH systems which would make it more efficient to operate. These factors could put off project developers from installing district heating (over and above the barriers of awareness and hassle that face other biomass heat technologies).</td>
<td>High</td>
<td>√ √ √ √ √ √ X √ Planning permission is less likely to be gained if the DH network is difficult to fit into the existing infrastructure.</td>
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<td>Barrier name</td>
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<tr>
<td>Planning permission (Approaches requiring DH)</td>
<td>Extensive permitting and consenting is required to install heat transmission infrastructure underneath existing public highways. Even if the technical issues identified above could be overcome, this barrier may serve to prevent some projects moving forward to the timescales necessary to make the project viable (or even altogether).</td>
<td>Medium</td>
<td>n/a</td>
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<tr>
<td>System design problems (Approaches requiring DH)</td>
<td>Current buildings poorly designed to exploit DH effectively – leads to overheating of buildings which results in higher air conditioning use. There is also the potential for heat loss which can result in higher prices for end users. If end users are not certain that they will be able to have the level of heat they want, when they want it, they will be less likely to install DH.</td>
<td>Medium</td>
<td>Negative perception of DH increases if overheating or extra cost is experienced.</td>
</tr>
<tr>
<td>Negative perception of district heating (Approaches requiring DH)</td>
<td>Lack of familiarity with technology and contractual arrangement. Concerns about level of heat service (comfort levels, reliability, and maintenance). This may prevent project developers from taking forward a scheme, both as a result of negative perceptions on their side but also of negative perceptions on the side of eventual end users to whom they must market the idea.</td>
<td>Medium</td>
<td>n/a</td>
</tr>
<tr>
<td>Relative immaturity of technology (compared to fossil fuel alternatives) (CHP)</td>
<td>Biomass CHP technology seen as higher risk than other CHP options, especially gasification. This may act as a disincentive for users to switch to renewables.</td>
<td>Medium</td>
<td>Lack of confidence due to relative immaturity of technology increases 'hassle' factor due to need for additional research/information.</td>
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### Biomass

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<tr>
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<th>Impact on other barriers: What and how?</th>
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<tr>
<td>Exporting electricity to grid (CHP)</td>
<td>Selling electricity back to grid is both complex and financially unattractive as generators receive a low rate. There is a need for users to understand the economic impacts and practical requirements of selling electricity to the grid for a project to be considered financially viable. e.g. determining ROC allocation complicated if user is not familiar with the scheme and given a market price, can be uncertain.</td>
<td>Low²</td>
<td>Increases &quot;hassle&quot; factor and financial viability of project.</td>
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<td>Barrier name</td>
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<tr>
<td>Lack of trained engineers and plumbers</td>
<td>The installation and maintenance of new biomass heat plants requires skilled personnel. If there is not a sufficient number of trained engineers, this will prevent and delay biomass heat uptake.</td>
<td>High</td>
<td>Yes: limited availability of skilled installers will pose problems for suppliers.</td>
</tr>
<tr>
<td>Air Quality issues</td>
<td>The burning of biomass can present issues for air quality. This can have an impact in two different ways: (i) biomass boilers may be required to meet stringent emissions standards (affecting fuel and technology choice) and (ii) their use may not be possible in some areas at all if it would take air quality standards beyond limits specified in the Clean Air Act.</td>
<td>High</td>
<td>No</td>
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<td>Barrier name</td>
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<tr>
<td>District heating Infrastructure</td>
<td>The installation of district heating systems will require significant changes to infrastructure which may take a number of years. The size of the pipes used in district heating (10-15 greater than those used in natural gas systems) may restrict their application to very high density areas. Retrospective installation is exceptionally expensive and disruptive.</td>
<td>High²</td>
<td>Yes: a lack of district heating infrastructure limits the amount of biomass heat which could be distributed effectively. Since DH is most efficient biomass heat method this is a major disadvantage.</td>
</tr>
<tr>
<td>Unreliable supply</td>
<td>There is a lack of intermediaries that are creditworthy and have a variety of contracts that enable them to mitigate climatic, price and other risks. Fuel import and handling infrastructure is also expected to cause a constraint in future.</td>
<td>High</td>
<td>Yes: unreliable fuel supply makes it difficult for suppliers to secure a constant heat supply.</td>
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<tr>
<td>Lack of competitive products/technical viability in on-gas areas</td>
<td>Vast majority of dwellings’ heating demand in UK is served by natural gas systems. Biomass systems cannot compete in terms of capital, fuel supply, size in this market, which is a gas replacement rate of 1.5 million units per year.</td>
<td>Medium</td>
<td>Yes: lack of market impedes supplier development.</td>
</tr>
<tr>
<td>Complexity and feasibility of using heat generated in biomass CHP schemes</td>
<td>Heat recovery systems are often not fitted as the dis-benefits of a potential loss of electrical generation capacity, combined with low value for heat outweigh the benefits in many circumstances.</td>
<td>Medium/ High</td>
<td>Yes</td>
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<td>Barrier name</td>
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<tr>
<td>Definition of biomass waste</td>
<td>Forestry materials, municipal arisings and straw are all secondary products; consequently some of these materials might fall under the legal definition of waste. Waste falls under certain regulations which affect storage, handling, transport and use for heat generation. Yes: some sorts of biomass cannot be used / have to be treated differently by suppliers. Yes: an association of biomass heating with waste can cause negative perceptions of the technology. It also has planning implications.</td>
<td>Medium/High</td>
<td>✓ ✓ ✓ ✓ ✓ ✓ X ✓</td>
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<td>Barrier name</td>
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<td>Lack of high specification kit manufacturers</td>
<td>Manufacturing capacity in the UK is fairly limited. However, equipment is widely available from other European countries such as Austria and Italy.</td>
<td>Medium</td>
<td>Yes: planning permission is a prerequisite for the successful integration of biomass plants.</td>
</tr>
<tr>
<td>Long term planning processes and the risks of planting</td>
<td>Planning permission is a prerequisite for the successful integration of biomass plants.</td>
<td>Medium</td>
<td>Yes: planning permission is a prerequisite for the successful integration of biomass plants.</td>
</tr>
<tr>
<td>High space requirements</td>
<td>A potential barrier to the deployment of pallet or waste space requirements for example. Higher than expected costs compared to gas-fired boilers. This is due to the larger boiler size, the need for fuel delivery infrastructure and adequate fuel storage.</td>
<td>Medium</td>
<td>Yes: larger equipment in comparison to conventional heating systems will prevent suppliers to install biomass plants.</td>
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<td>Barrier name</td>
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<tr>
<td>Lack of new companies set up</td>
<td>The number of existing companies is not sufficient to achieve a significant uptake of biomass heat.</td>
<td>Medium</td>
<td>Yes: a lack of suppliers will automatically limit supply.</td>
</tr>
<tr>
<td>Lack of ESCo development</td>
<td>Energy Service Companies can mitigate against the high cost of equipment and fuel supply insecurities by selling heat rather than equipment/fuel.</td>
<td>Medium</td>
<td>Yes: novel products would bring new markets into focus.</td>
</tr>
<tr>
<td>Barrier name</td>
<td>Description of barrier</td>
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<tr>
<td>Geographic coverage – travel requirenents</td>
<td>There can be a lack of local suppliers in some areas, meaning that suppliers have to travel relatively long distances to service their customers. This not only increases response times and so costs but also reduces the number of customers a supplier can help.</td>
<td>Low</td>
<td>Yes: distances between suppliers and customers makes it time consuming and costly to service the whole UK area. Yes: customers prefer a local contact that is more visible and readily accessible.</td>
</tr>
<tr>
<td>Barrier name</td>
<td>Description of barrier</td>
<td>Ranking</td>
<td>Supply side</td>
</tr>
<tr>
<td>-----------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>--------</td>
<td>-------------</td>
</tr>
<tr>
<td>Resource (fuel) availability</td>
<td>Biomass heat is dependent on resources such as wood, straw, energy crops and waste. The amount of resources available are a potential barrier to the uptake of biomass heat. (We assume that competition from other markets will be addressed via the relative economics of different uses).</td>
<td>Low</td>
<td>Yes: a limited resource base can potentially limit the available fuel for biomass heat plants.</td>
</tr>
<tr>
<td>Poor historical performance</td>
<td>Despite the maturity of the technology, plant performance has often fallen below desired standards.</td>
<td>Low</td>
<td>No: there is sufficient well established equipment available from other countries such as Austria.</td>
</tr>
</tbody>
</table>
Appendix D
Questionnaire Covering Letter and Results
My name is James Constable from the University of Exeter, Cornwall Campus; currently studying an MSc in Energy Policy and Sustainability. I am also participating in an internship with Regen South West.

I am carrying out research for my thesis into the potential barriers to the success of the Renewable Heat Incentive (RHI), which as you may know is currently under consultation. It has been organised for the results of this research project to be presented to both Regen South West, and The Department for Energy and Climate Change (DECC).

Conceptually, the RHI has the potential to dramatically increase renewable heat in the UK. However it is important to fully understand the current barriers to renewable heat development in the South West, in order to identify areas for further support in the future, and fully capitalise on the support offered by the RHI.

My research project aims to identify the potential success of the RHI, and what areas of national policy may be required to adapt as a result of barriers to effective and rapid renewable heat deployment.

You have been chosen as a recipient of this questionnaire as your business/organisation/person have been identified to have installed or be in the process of installing a biomass renewable heat technology in the South West.

I am interested in identifying both demand and supply side barriers that you may have had contact with, both financial and non-financial.

Any information/views that you may chose to identify in the below questionnaire will remain anonymous and will not be held on file after the submission of the research project to the University of Exeter.

I would appreciate your views on this issue. If you are willing to participate; please follow the link below and go direct to the on-line survey:

http://www.surveymonkey.com/s/KZQPCFQ

Alternatively, if you choose to participate in the semi-structured telephone interviews, then it is possible to fill the questionnaire in over the phone, directly with myself.

Following this questionnaire I will be carrying out casual, semi-structured telephone interviews. I would be grateful if you could be involved in these also. They will not take long; no longer than 1/2 and hour maximum. These interviews will allow for a more in-depth understanding of the barriers faced by businesses/organisations/people in the South West when choosing to implement renewable heat technology and will enable you to voice your concerns and opinions anonymously in regards to the capabilities of the future of wood-fueled renewable heat development under the proposed RHI. Any information/views that you may chose to identify in the interviews will remain anonymous and will not be held on file after the submission of the research project to the University of Exeter, unless otherwise stated by yourself.

All telephone interviews will be carried out between 1st July and 5th August (or later subject to circumstance)

If you would like to be involved in the telephone interviews please contact me on either:

jc422@exeter.ac.uk or ########################

Thank you for your time and I look forward to hearing from you,

Best regards,

James Constable
1. **Was the capital cost of your organization/business/person's wood-fuelled renewable heat capacity financed by a grant-based funding mechanism?**

<table>
<thead>
<tr>
<th>Response</th>
<th>Percent</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>92.9%</td>
<td>13</td>
</tr>
<tr>
<td>No</td>
<td>7.1%</td>
<td>1</td>
</tr>
<tr>
<td>Do not know</td>
<td>0.0%</td>
<td>0</td>
</tr>
</tbody>
</table>

   **answered question 14, skipped question 0**

2. **Is your wood-fuel provider located in the South West region of the UK?**

<table>
<thead>
<tr>
<th>Response</th>
<th>Percent</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>100.0%</td>
<td>13</td>
</tr>
<tr>
<td>No</td>
<td>0.0%</td>
<td>0</td>
</tr>
<tr>
<td>Do not know</td>
<td>0.0%</td>
<td>0</td>
</tr>
</tbody>
</table>

   **answered question 13, skipped question 1**

---

1. From our own Estate in the Teign Valley                  Wed, Aug 4, 2010 9:07 AM  Find...
2. We have our own woodfunds. BTW, the answer to question 1 above is 'partially', and not nearly as much as was promised before we made the commitment which are not options in your answers      Wed, Jul 14, 2010 7:54 AM  Find...
3. Home-grown Miscanthus—from our own farm about 1 mile from the point of use       Tue, Jul 13, 2010 8:45 AM  Find...
4. Welshbiofuels originally, but they went bust. We now use Foreverfuels       Tue, Jul 13, 2010 5:40 AM  Find...
5. Shapton wallet                                        Fri, Jul 9, 2010 6:41 AM  Find...
6. denin                                              Thu, Jul 8, 2010 2:10 PM  Find...
7. Okelahampton                                     Wed, Jul 7, 2010 11:02 PM  Find...
8. Forest Fuels, Okehampton                             Tue, Jul 6, 2010 5:03 AM  Find...
3. Prior to the installation of renewable heating capacity, please choose from the answers below to best describe the previous source of non-renewable heat supply.

<table>
<thead>
<tr>
<th>Source</th>
<th>Response Percent</th>
<th>Response Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas (Mains Gas)</td>
<td>18.2%</td>
<td>2</td>
</tr>
<tr>
<td>Gas (LPG)</td>
<td>0.0%</td>
<td>0</td>
</tr>
<tr>
<td>Gas (LNG)</td>
<td>0.0%</td>
<td>0</td>
</tr>
<tr>
<td>Oil</td>
<td>72.7%</td>
<td>8</td>
</tr>
<tr>
<td>Electricity</td>
<td>0.0%</td>
<td>0</td>
</tr>
<tr>
<td>Coal</td>
<td>0.0%</td>
<td>0</td>
</tr>
<tr>
<td>Do not know</td>
<td>9.1%</td>
<td>1</td>
</tr>
</tbody>
</table>

1. none
2. Both the sites that have biomass were new builds so no previous heat supplies were present
3. New building so no existing fuel source

answered question 11
skipped question 3
4. Please identify what the reasons were for your organization’s/group’s drive to implement a wood-fuelled renewable heat system?

<table>
<thead>
<tr>
<th>Reason</th>
<th>Response Percent</th>
<th>Response Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost benefit of fuel switch</td>
<td>42.5%</td>
<td>5</td>
</tr>
<tr>
<td>Aim to capitalise on a Grant Mechanism</td>
<td>14.3%</td>
<td>2</td>
</tr>
<tr>
<td>Desire to consume energy more sustainably</td>
<td>82.6%</td>
<td>13</td>
</tr>
<tr>
<td>An aim to increase energy security</td>
<td>28.6%</td>
<td>4</td>
</tr>
<tr>
<td>Desire to produce heat energy locally</td>
<td>35.7%</td>
<td>5</td>
</tr>
<tr>
<td>To promote South West businesses through supporting local wood-fuel supply chains</td>
<td>0.0%</td>
<td>0</td>
</tr>
<tr>
<td>Aiming to generate a green unique selling point for your company/product</td>
<td>25.6%</td>
<td>4</td>
</tr>
</tbody>
</table>

1. Side benefit of providing some rural employment during winter rather than profit going to multinational industry directors bonuses and shareholder.
   Side benefit of reviving our derelict copices in proper rotation for wildlife.
   "Wished to spend the rest of my life arguing pointlessly with Defra officials who cannot understand a simple proposition such as coppicing and local consumption and who only understand giving environmental grants to multinational companies (such as Tate & Lyle) to inflate director’s bonuses and shareholder’s profits.

2. utilising home-grown biofuel crop                                   | Tue, Jul 13, 2010 0:45 AM | Find... |
3. UDC is a totally sustainable off grid education experience          | Thu, Jul 8, 2010 2:10 PM  | Find... |
4. The buildings were built to very high standards and to meet all the environmental legislation and to be as green as possible. | Wed, Jul 7, 2010 11:02 PM | Find... |
5. To make better use and a reason for better management of our woodlands | Wed, Jul 7, 2010 1:58 AM  | Find... |

answered question: 14
skipped question: 0
5. Please choose from the options below; what from your organisation/business/person’s experience would you consider to be barriers when implementing a wood-fuelled renewable heat technology in the South West?

<table>
<thead>
<tr>
<th>Barriers</th>
<th>Unimportant</th>
<th>Slightly Important</th>
<th>Important</th>
<th>Very Important</th>
<th>Vital</th>
<th>Rating Average</th>
<th>Response Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shortage of skilled professionals; including accredited technology installers, built environment expertise, consultants etc</td>
<td>23.1% (3)</td>
<td>0.0% (0)</td>
<td>23.1% (3)</td>
<td>15.4% (2)</td>
<td>38.5%</td>
<td>3.46</td>
<td>13</td>
</tr>
<tr>
<td>Planning</td>
<td>23.1% (3)</td>
<td>30.8% (4)</td>
<td>15.4% (2)</td>
<td>7.7% (1)</td>
<td>23.1%</td>
<td>2.77</td>
<td>13</td>
</tr>
<tr>
<td>Concerns over the potential availability/security of wood-fuel supply</td>
<td>15.4% (2)</td>
<td>7.7% (1)</td>
<td>23.1% (3)</td>
<td>38.5% (5)</td>
<td>15.4%</td>
<td>3.31</td>
<td>13</td>
</tr>
<tr>
<td>Concerns over the sustainability of wood-fuel supply</td>
<td>15.4% (2)</td>
<td>23.1% (3)</td>
<td>7.7% (1)</td>
<td>38.5% (5)</td>
<td>15.4%</td>
<td>3.15</td>
<td>13</td>
</tr>
<tr>
<td>A lack of confidence in biomass technologies</td>
<td>15.4% (2)</td>
<td>15.4% (2)</td>
<td>23.1% (3)</td>
<td>30.8% (4)</td>
<td>15.4%</td>
<td>3.15</td>
<td>13</td>
</tr>
<tr>
<td>Hassle-Factor; was the extra effort required to switch heat source a delaying time+cost barrier to implementation</td>
<td>30.8% (4)</td>
<td>23.1% (3)</td>
<td>38.5% (5)</td>
<td>7.7% (1)</td>
<td>0.0%</td>
<td>2.23</td>
<td>13</td>
</tr>
<tr>
<td>Concerns over emissions to the air</td>
<td>53.8% (7)</td>
<td>23.1% (3)</td>
<td>15.4% (2)</td>
<td>7.7% (1)</td>
<td>0.0%</td>
<td>1.77</td>
<td>13</td>
</tr>
<tr>
<td>Concerns over the carbon intensity of wood-fuelled renewable heat</td>
<td>38.5% (5)</td>
<td>23.1% (3)</td>
<td>38.5% (5)</td>
<td>0.0% (0)</td>
<td>0.0%</td>
<td>2.00</td>
<td>13</td>
</tr>
<tr>
<td>System design problems; inclusive of retro-fit and new build installations</td>
<td>15.4% (2)</td>
<td>0.0% (0)</td>
<td>7.7% (1)</td>
<td>23.1% (3)</td>
<td>53.8%</td>
<td>4.00</td>
<td>13</td>
</tr>
<tr>
<td>Selling electricity to the grid; relevant to CHP only</td>
<td>62.5% (5)</td>
<td>12.5% (1)</td>
<td>0.0% (0)</td>
<td>12.5% (1)</td>
<td>12.5%</td>
<td>2.00</td>
<td>8</td>
</tr>
<tr>
<td>Availability of wood-fuel supply/wood-fuel suppliers</td>
<td>15.4% (2)</td>
<td>15.4% (2)</td>
<td>23.1% (3)</td>
<td>7.7% (1)</td>
<td>38.5%</td>
<td>3.38</td>
<td>13</td>
</tr>
<tr>
<td>Availability of biomass technology suppliers</td>
<td>7.7% (1)</td>
<td>23.1% (3)</td>
<td>38.5% (5)</td>
<td>7.7% (1)</td>
<td>23.1%</td>
<td>3.15</td>
<td>13</td>
</tr>
<tr>
<td>Space availability for wood-fuel storage</td>
<td>38.5% (5)</td>
<td>30.8% (4)</td>
<td>7.7% (1)</td>
<td>7.7% (1)</td>
<td>15.4%</td>
<td>2.31</td>
<td>13</td>
</tr>
<tr>
<td>Inadequately regulated fuel supply chain</td>
<td>46.2% (6)</td>
<td>7.7% (1)</td>
<td>30.8% (4)</td>
<td>0.0% (0)</td>
<td>15.4%</td>
<td>2.31</td>
<td>13</td>
</tr>
<tr>
<td>Underdeveloped renewable heat market structure</td>
<td>41.7% (5)</td>
<td>0.0% (0)</td>
<td>25.0% (3)</td>
<td>16.7% (2)</td>
<td>16.7%</td>
<td>2.67</td>
<td>12</td>
</tr>
</tbody>
</table>
6. Are you aware of the Renewable Heat Incentive (RHI) currently under consultation? If your answer is No, then please go directly to the last question.

<table>
<thead>
<tr>
<th>Response</th>
<th>Percent</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>53.8%</td>
<td>7</td>
</tr>
<tr>
<td>No</td>
<td>46.2%</td>
<td>6</td>
</tr>
</tbody>
</table>

Answered question | 13  
Skipped question | 1

8. If you are familiar with the RHI currently under consultation, is there a particular point that you would like to raise about the RHI, either positive or negative?

1. Let's get a decision asap as to when it will start and what it will be worth  
   Wed, Aug 4, 2010 9:07 AM

2. Haven't had a chance to properly consider it yet.  
   Wed, Jul 14, 2010 7:54 AM

3. Energy production estimate, is it an accurate way to provide an income by estimating the load a particular system will produce annually  
   Fri, Jul 9, 2010 6:41 AM

4. AD plants should be on a separate tariff. This is a technology which has the potential to make a huge difference by processing and capturing waste and should be given a higher rate to incentivise the investment  
   Wed, Jul 7, 2010 1:19 AM

5. I don't understand how the payment is to be calculated, seemed to be based on the heat required for the house and I'm not sure how that is assessed  
   Wed, Jul 7, 2010 1:56 AM

Answered question | 5  
Skipped question | 9
7. If you are aware of the Renewable Heat Incentive (RHI) currently under consultation, do you feel that the policy has the potential to overcome any barriers that you have highlighted above and any that have not been highlighted?

<table>
<thead>
<tr>
<th>Barriers</th>
<th>Response Percent</th>
<th>Response Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shortage of skilled professionals; including accredited technology installers, built environment expertise, consultants etc</td>
<td>60.0%</td>
<td>3</td>
</tr>
<tr>
<td>Planning</td>
<td>20.0%</td>
<td>1</td>
</tr>
<tr>
<td>Concerns over the potential availability/security of wood-fuel supply</td>
<td>60.0%</td>
<td>3</td>
</tr>
<tr>
<td>Concerns over the sustainability of woodfuel supply</td>
<td>0.0%</td>
<td>0</td>
</tr>
<tr>
<td>A lack of confidence in biomass technologies</td>
<td>40.0%</td>
<td>2</td>
</tr>
<tr>
<td>Hassle-Factor; the extra effort required to switch heat source</td>
<td>20.0%</td>
<td>1</td>
</tr>
<tr>
<td>Concerns over emissions to the air</td>
<td>0.0%</td>
<td>0</td>
</tr>
<tr>
<td>Concerns over the carbon intensity of wood-fueled renewable heat</td>
<td>0.0%</td>
<td>0</td>
</tr>
<tr>
<td>System design problems; inclusive of retrofit and new build installations</td>
<td>40.0%</td>
<td>2</td>
</tr>
<tr>
<td>Selling electricity to the grid; relevant to CHP only</td>
<td>20.0%</td>
<td>1</td>
</tr>
<tr>
<td>Availability of wood-fuel supply/wood-fuel suppliers</td>
<td>80.0%</td>
<td>4</td>
</tr>
<tr>
<td>Availability of biomass technology suppliers</td>
<td>20.0%</td>
<td>1</td>
</tr>
<tr>
<td>Space availability for wood-fuel storage</td>
<td>0.0%</td>
<td>0</td>
</tr>
<tr>
<td>Inadequately regulated fuel supply chain</td>
<td>40.0%</td>
<td>2</td>
</tr>
<tr>
<td>Underdeveloped renewable heat market structure</td>
<td>80.0%</td>
<td>4</td>
</tr>
<tr>
<td>Unfamiliar with the RHI</td>
<td>20.0%</td>
<td>1</td>
</tr>
</tbody>
</table>
Appendix E
Interview with Erich Scherer; DECC, RHI
Policy Development Officer
<table>
<thead>
<tr>
<th>James</th>
<th>You are probably aware that the new gov hasn’t made a full announcement on the RHI as such, which means that what I can tell you is very limited, I can’t give you any info on commitments on what is going to happen in this respect, all I can discuss is limited to general questions of how one designs RES-H support, also statistics may be a problem! So we’ll just have to see how it goes, on the one hand I will be limited in the answers I can give you, as well I believe that if you want to quote me on anything I want to see what it is.</th>
</tr>
</thead>
<tbody>
<tr>
<td>James</td>
<td>Absolutely, I will write this up and send you a transcript and before I use anything I will check this through with you.</td>
</tr>
<tr>
<td>Respondent</td>
<td>Yep, no problem</td>
</tr>
<tr>
<td>James</td>
<td>I wont use your name or your position….</td>
</tr>
<tr>
<td>Respondent</td>
<td>Even that is not a problem, as long as I can clear it you are welcome to quote me.</td>
</tr>
<tr>
<td>James</td>
<td>Excellent, so the project has developed and is actually quite different now. I have been trying to assess the impact that the RHI will have on a RES-H tech in a UK region as the grants are phased out. So I have selected woody-fuelled biomass, mainly because it has done well in the South West already and through my internship with Regen SW, and they have had a lot of success with that technology in the South West and are looking toward it as something that can deliver high carbon saving and benefit for the economy in lots of ways for the future, I am analyzing the RHI’s effect on incentivizing potential stakeholders in the SW. I have questionnaire every wood-fuelled operator in the SW that I can find; I have then been interviewing those who wanted to take it further and try to analyze what the barriers were when developing RES-H in the South West. There are many issues that I have collected through my research that people are concerned about developing in the future, so what I would like to do is go through these barriers and work out how you can see RES-H markets developing in the UK, I know that you are restricted as to what you can comment on; does this sound ok?</td>
</tr>
<tr>
<td>Respondent</td>
<td>Sure,</td>
</tr>
<tr>
<td>James</td>
<td>Excellent, so I have had few trusts involved, one being the NHS, essentially what they have said, is that because the grants are moving away, they will not be looking at any other system of implementation other than using an ESCO to own and operate, finance and source the technology. How do you feel about whether the RHI is Incentivising ESCOs to pop up, and is that something that the gov wants? Or is it more designed towards the actual stakeholder owning and operating the system?</td>
</tr>
<tr>
<td>Respondent</td>
<td>Well my first reaction to that is that it is fairly irrelevant in terms of the outcome, so if ESCOs are the means by which the market delivers RES-H projects then so be it, I think in terms of outcome for us saying whether an ESCO delivers RES-h or the primary, top company of a particular stakeholder I suppose the only question that you can ask there is whether in terms of…policy intervention it makes a difference, if stakeholders chose the ESCO route in terms of what policy assistance they need….Now I should also probably have said more generally, my position here is in the RE financial incentives team so that means that that over coming non-financial barriers is not my main area and so if we talking about this</td>
</tr>
</tbody>
</table>
example, does ESCO delivery require any policy intervention from government in terms of overcoming non-financial barriers? I couldn’t comment on that. I am not aware that we consider that one of the areas that we need to focus on, but again I suppose in terms if what policy interventions look like it is quite clear to us that you need policy interventions on the financial incentive side and in interventions to overcome non-financial barriers and there is of course a whole range of non-financial barriers in relation to renewable heat. Whether or not you set it up through escos is not one that I am particularly familiar with I would imagine it depends greatly on the type of stakeholder you are talking to and what project size you are talking about. If you are talking about an organisation the size of the NHs, and the kinds of projects they will be doing in RES-H for a particular hospital, just given the project size I would imagine any lawyer would simply advise them to deliver through an ESCO so my guess would be that that structure would be applied pretty much regardless of the policy financial incentive. I would imagine that that’s more about what the advisors advise in an institution of that size to do in order to manage project risk.

James

Ok, how do you feel…do you feel confident that moving from a grant based mechanism to a revenue based mechanism is appropriately timed to be effective at this stage in RES-H development? In a financial situation…

Respondent

Well…there’s a lot of questions there… I think first of all in principal….our policy is that it is the right move…and again talking in principle….I think you will see that this is borne out generally by academic opinion ….for renewable energy know how has been developing over decades and internationally, I think that there is a pretty good consensus now on some of the main aspects of it…for instance shared also by the international energy agency in terms of what you need to do to bring forward RE, and its about a combination of long term support structure, overcoming financial barriers and overcoming non-financial barriers. Now grants, within that overall perspective, grants have typically suffered from some major downsides. They are typically not long term, even if a gov intends to put a grant program in long term they are always subject to what the gov of the day thinks, financial pressures developing year to year, so the concept academically, referring to this stop and go – is of paramount importance, and this is where historically grants have suffered most. So if we know that there is stop and go, which is very damaging to a market like renewables which relies on incentives … then that means grants have an inherent problem unless you can some how provide that market certainty some other way, so that’s one of the reasons why at a high level we’ve sais; if we want to roll this market out beyond the kind of comparatively small scale development that you see on a grant scheme, you need something more structural that doesn’t necessarily the nature of the payment has to be different because that is another aspect. Grants are typically paid as up-front capital payments, whereas revenue payments are typically spread out payments over the years….so those are as such two distinguishable features. One is how a scheme provide long-term certainty, and the other is does it provide up-front payments or revenue based payments? So….if you are talking up-front vs. revenues based that’s probably a more delicate balance between arguments saying on the one hand, particularly in an
emerging markets people need help with up-front payments, and on the other also saying that if you open yourself up to up-front payments you run the risk that equipment is not used over the lifetime… and so where we’ve been traditionally on that is that if you are able to put a system in place that does provide long term certainty then doing it in a revenue based way does encourage the long-term use of the equipment and still the long-term certainty of the scheme should allow the commercial market to come up with financial packages that should where necessary turn those into front-loaded payments.

James

So you are looking to private institutions to deliver the front-loaded aspect of the RHI.

Respondent

In our current thinking we would, as we proposed, look to the market to deliver that frontloading.

James

And is DECC going to deliver this in any way? Or primarily to a free market response to the RHI

Respondent

Well….we haven’t published any proposals at this time on gov intervention on front-loading as such; with a caveat, the new gov has of course made a commitment to a green deal which would probably only apply small scale end of projects, but if implemented that could provide a way of front-loading but at this stage its not clear whether that is going to be available for renewables. Other than the possibility of green deals which still remain to be seen there are not currently any policy proposals for front-loading. Looking at the experience in other countries like France and Germany and certainly the impressions that we have had from stakeholders here. There is certainly the impression that, as long as you provide a scheme that’s easy to understand and sufficiently reliable for the market, then the market should be able to come forward with packages that can finance it.

James

Moving on from that aspect of the policy, I have spoken to lots of small scale developers, and there are a surprising amount of them in the SW, and often they were fuel poor prior to having the grant to install the RES-H; the response I got from them was that the consultation is very complicated and understand and this is I understand, very difficult to avoid

Respondent

yes

James

I think one of the main things that has come out of these interviews with small scale stakeholder is their reluctance to take on the debt and to finance these installations, because it’s the complexities of the whole process, having to project manage a really intricate piece of tech, and they are not experts, I am just wandering whether what people are really asking for is a separate system or tariff for small scale stakeholders that are simpler and easier to access

Respondent

Generally simplicity of the scheme is understood as being a crucial part of this and if we look at the background of where the overall drive for this kind of structure comes from, the FiT, which is considered to be the simplest kind of support scheme around and seems to tick all the boxes in terms of people understanding it, and so the RHI proposals do try and model a lot of their features on FiT approach but of course there are additional complexities on the RES-H side which certainly provide challenges in terms of providing solutions to those issues and still have available and simple

James

What would you say these extra complexities and barriers would be?
Respondent: Well let's come back to that in a moment, so it certainly more challenging to make the RHI as simple and user friendly as the FiTs are, that is nevertheless still the objective. But if you then look specifically at FP then it is understood that regardless of how simple a system is, if you provide anything that requires FP to develop a project/manage and finance it then this faces very difficult barriers. That's quite clear, but I that this brings us again to the question, what other players in the market can do. We've talked about financing just talking about commercial finance packages. But were also potentially talking about local authorities as a method of tackling FP, through renewables where a competent professional LA could look at the FiT on offer, given that it is based on a rate of return which we consider viable and being able to do the math’s. Does that mean that the LA can make money allow the FP, under their care, to make money. So that would be again something where you can see how the policy works out, but conceptually that should make as much sense as other companies stepping in for instance through ESCOs and providing those packages to non-fuel poor domestic customers. So yes, I suppose that's on that side, you also want to know what are the additional complexities to RES-H development?

James: Yes, you were involved in the NERA paper on the design of the RHI, so you clearly know what the barriers are to RES-H development. But I want to get an understanding of what you consider to be serious development barriers.

Respondent: I am not sure if u can summarize this comprehensively. But certainly some of the things that you run into when you are trying to develop RES-H that you don’t have to deal with RE is firstly that heat tends to be on site. So, FiTs by their very name rely on there being a grid and you feed-in as much as you want and the grid will take care of it. So in terms of compensation its pretty simple. What ever you feed in you get paid for. So that's certainly one of the main challenges when you are talking about heat, that heat is by definition only useful if it is used on-site or locally, and even then heat isn’t the same as useful heat. Heat can be pumped up chimneys and leaking into the air or it can be used t heat the building in winter or unnecessary in the summer. So it is definitely a challenge to define what useful heat is and to make sure that you only reward useful heat. And related challenge to that is the balance between metering and deeming.

James: And that is something again that, um, that smaller developments have voiced a concern about in regards to the RHI consultation. Larger groups and businesses are more confident in looking at long term in regards to the RHI and quite happy with the payments that are involved with metering heat; smaller developments have said that they would have preferred an RHI that is metered for them as well, instead of a deemed requirements. It is interesting to see why its been structured so that its almost easy for large scale developers than it is for small scale.

Respondent: Well its not just about the cost of metering… I think what a lot of people don’t understand is if you simply meter for compensation per Kw, you have to remember that the RHI support would cover an element of capital expenditure and an element of running costs and so if you turn capital expenditure into compensation per Kwh, and you compare that to the input cost per/kwh….so if you ran a big biomass plant they are paying for the
input biomass fuel, and they get compensation for some of the input fuel, but also some of the capital cost, so that combination of support may exceed the input biomass fuel and that’s where the problem starts. So if you then meter you are telling the company – well please burn as much as you like because you will then get money for every unit that you burn more. That’s the problem with metering. So, the costs of meters are one aspect, but the real issue is how you avoid the perverse incentive for over generation. Which brings us back to how RES-H is different to RES-E, because the problem of over generation does not exist? E is by definition always good. At some point we will hit the point where our nuclear generation added to the energy generated from wind farms may exceed demand and then again you have got an issue but that is a separate discussion for us…

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<th>James</th>
<th>So another barrier I have come across is this issue surrounding MCS accreditation which at the Regen SW conference you received many questions over the confusion over MCS accreditation. The high cost of MCS accreditation seems to be the main issue in the SW. Can you see this being a barrier to rapid deployment of RES-H across the country?</th>
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<td>Respondent</td>
<td>We are obviously aware that there have been concerns raised about MCS and again this is about a balance between factors so, I cant say anything about what we would be doing in that respect in the end. But in terms of the balance of factors it is quite clear that people are saying to us the some aspects of MCS are not sufficiently mature, there is the cost of MCS as well and so those factors could arguably be seen as barriers to uptake, but on the other hand to the extent that we have seen RES-H uptake so far, certainly at the domestic scale, its been accompanied by a lot of bad press on solar thermal cowboys and similar stories. So its very important to provide a level of comfort to customers because again almost everything in RE hinges on market confidence and its not just market confidence in the longevity of a support scheme but its also market confidence in technologies such as now need to be installed. So naturally it is certainly at the small scale its important to consider how we can provide that kind of comfort to people who are not professionals themselves. Large scale you can obviously ask companies and organisations that they have the necessary support themselves. Weighing up that balance is very difficult. One part of the story would certainly be to look at how MCS can be improved and delivered but that is not something that happens over night either.</td>
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<th>James</th>
<th>Firstly I want to ask you about another side of issues which are the administration of the RHI, and secondly about the concern about the accessibility and ease of using the RHI because of the way that it has been set up to be administered by Ofgem which has never fully carried out this role; am I right?</th>
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<td>Respondent</td>
<td>Well not entirely because it has administered the RO scheme which also had a micro generation angle to it.</td>
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<td>James</td>
<td>I suppose what people are really concerned about is having an unregulated heat market – primarily in context to fuel supply and cost of wood fuel. It seems to make it more complicated than RES-E. Because the main difference is the fuel stream going into the RE technology. The question is whether large industry players would prefer to see regulation forming around wood fuel supplies and price completion.</td>
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<td><strong>Respondent</strong></td>
<td>I am not in the position to comment on the regulation of fuel prices. I think you could make that argument as much for RE fuel prices as you could for FF prices and so it is obviously important not to forget that if we are talking about the input fuel in RES-H it is in many cases E if you are talking heat pumps, and E prices themselves are a commodity....I again don't want to comment on the regulation of fuels as such but I would just say that if one wanted to make the argument for one fuel I think they would hard put to make that argument without also explaining how or why you should regulate the other fuel input. I think apart from that it raises another question that we also addressed in the consultation document, which is how if at all tariffs should respond to fluctuations in fuel prices. This is again a balance of factors, where on the one hand you are coming back to the fact that we discussed early; predictability, certainty and simplicity of the scheme. And a predictable, certain and simple tariff scheme is one that is set at the beginning of the project and will hopefully not change but that means that tariff would not be able to change in wood-fuel prices for instance, whereas on the other hand you could argue for a tariff that might fluctuate in response to those kinds of price changes but in the absence if a single price for wood-fuel traded on some sort of exchange....its actually quite difficult to determine in a predictable way how your tariff would fluctuate and if you were to say to the market well you will get this tariff for year one, but in the future the tariff will fluctuate as we see fit...well that may not necessarily provide the investor confidence that you need either.</td>
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<td><strong>James</strong></td>
<td>So what you are saying is that effective grandfathering is very important?</td>
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<td><strong>Respondent</strong></td>
<td>Yes, absolutely, very much so....</td>
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<tr>
<td><strong>James</strong></td>
<td>I suppose that everything is new, the tech, the policy, the market is new, RE is essentially still new...there is still so many issues with smoothing over these problems and getting people to invest in something that is brand new. I imagine in the consultation response these issues have been raised; which is of course very good.</td>
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<td><strong>Respondent</strong></td>
<td>They definitely have, it also shows that in many of these aspects the solutions are not exactly simple.</td>
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<td><strong>James</strong></td>
<td>I wish I could ask you about whether it is going to come in or not!!! I wish I could....well....I have done work with Regen SW and their funding has been cut recently due to the loss of the RDA, in my opinion they have done well at acting as a business support unit for these projects; and you have mentioned Las stepping in to fill in the gaps of these institutions that have had funding cut. Are you looking to incentivise using Las to tackle issues like FP in relation to RES-H....</td>
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<td><strong>Respondent</strong></td>
<td>I can't comment on the wider gov policy in regard to RDAs and other regional representations; I would separate that from the question of the role of LAs which would be question with or without regional organisations. I think the only thing that we have identified is that there is a very promising potential role for organisations such as LAs, there could also be building societies, or there will be organisations managing council estates on behalf of LAs, or indeed coming back to ESCOs who of course will see a business opportunity and it all comes back to...does the tariff provide a financial incentive which makes it rationally desirable for any of these organisations to step in a try and package delivery of RES-H in this case. And so we certainly hope that this will be the case with ESCOs, with big utility</td>
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companies seeing that commercial opportunity there and similarly that it would make financial sense for LAs to do this. LAs will of course be slightly difference as they will have other interests as well in terms of helping the fuel poor. So you might have several factors working together to make it attractive to LAs to pick things up, but they will again have to sit down and do their calculations and see what the tariff gives them and see whether that’s enough to make it happen.

**James** Are you confident that this will happen?

**Respondent** I can’t express a level of confidence….I think that throughout this scheme and similar schemes; the philosophy is always been to take away the non-financial barriers, you provide a reasonable amount of money, and then you have to rely on the commercial drivers working. You take the market failures away and then that means that the market should then be working. But it all comes back always to what I mentioned earlier, the three crucial factors that need to come together for the market to rely on the framework. Which is longevity of the scheme, the financial barriers and the non-financial barriers, and if it then doesn’t happen then we can have another discussion…..(laughter) but that is the overall approach.

**James** Ok, excellent, in terms of the non-financial barriers being dissolved in time for the RHI to come in to play, or whatever heat incentive does come in by then, are you concerned about one particular area not being resolved?

**Respondent** I don’t think that I can answer that question, I do not work on the non-financial barriers. I think that what I can say is that none of these things happen over night or completely and that it is always going to be a step by step approach, I think that what you see historically is that if you don’t have the financial mechanisms in place then you don’t really get up take that is not in marginal quantities. If you do have the financial incentives in place then you put yourself in the position where widespread roll-out is feasible and then it becomes a more gradual analysis of how to/to what extent which non-financial barriers have been removed and whether those financial incentives are taken up or not. And no doubt, we will have to establish what the level of those barriers to the effective working of the those financial barriers is.

**James** Ok…just going back to that idea of grandfathering….the scope for tariff change; when designing it, have you designed the tariffs in the consultation so that they are fairly absolute? Do you expect the tariffs to shift in response to the consultation??

**Respondent** Well, interesting…there are no guarantees. The tariffs are proposals so they can change. They can change is response to the consultation response they can change is response to the govs view, changes in evidence. Obviously the tariff proposals give an indication. The proposals are based on a methodology. But we have asked for feedback both on methodology and the resulting tariff levels and the underlying cost assumptions and so on. All of these factors are being reviewed. As well as the more general question; what the gov will do with the RHI as such.

**James** I think we have covered almost everything.

**Respondent** We are ok for time

**James** Ok well lets talk about political risk….I know this is probably the main area that you cant comment on that much. People are going to be investing in political confidence that the RHI is a strong and well grandfathered policy.
Everyone I have spoken to has said that their main concern is that currently they don’t have confidence in…perhaps due to their opinions about gov decisions to do with the economy…they have very little confidence in political risk. How do you think that will affect people’s decision making process?

**Respondent**

Well clearly political risk is well known as one of the factors that determine market confidence/investor confidence which comes back to whether the framework provided does give enough confidence to the market, and that’s a very gradual thing. The most efficient policy framework is one that minimizes political risks because very difficult to determine. Two things can really happen, either the RES-H project doesn’t get built, or they get built on the basis of a higher risk margin. And so it is not a secret that not having a confirmation on the future of having an RHI in place poses a risk to the market. What it means is we have to work within a situation that is in front of us at the moment and of course it is a much wider situation dealing with RES-H; across the board policies need to be reviewed in line with their coalition governments priorities and as we know this is working towards an overall spending review….and so we will have to see all the policies including RHI fits with that so until that’s complete we wont, none of us will know what the exact future is with the RHI.

**James**

Which of course means that people who are looking to develop in the future are now in a situation because of this change in gov, recession and all of these things they are in some instances now in a position where they are looking to install FF systems because of the seemingly high political risk associated with the RHI and other RE policies. It seems as though it might be more sensible to ring fence these areas and say…to give certainty who are looking at developing. Can you comment on this?

**Respondent**

Not really beyond what I have said. We appreciate that the market would like to have certainty and we would like to give certainty as soon as we can. Unfortunately we have not reached that point yet. And this is simply because when you have a new gov, the new gov has to not only familiarize but also take a position on what’s going on and given the current financial climate that process of taking a position is a much wider one across gov where we have to see how the RHI fits with overall spending considerations so its….I don’t think that anyone would claim that it is ideal but that is where we are at the moment. And I do have to say that the period of uncertainty in advance to introducing a policy is going to be a risk even in the best cases. And so even if we were able to make a statement on the RHI now, until its all done and dusted, people are still going to have questions and even as we have seen with the FiT, once the scheme is in place, there are still things to be marked out a resolved. That is also simply the consequences of the fact the particularly with RES-H we are dealing with a new and complex area, so I think that intrinsically we have to accept that that kind of level of policy uncertainty at least initially was going to be there to a certain extent, no matter what. This is partly a consequence of doing something like this for the first time.

**James**

To what extent are you concerned about RES-H policy overlapping with EE policy? And in some cases this having the potential to pull policies in different directions?

**Respondent**

So again reflecting what was in the consultation document, and again this is
one of the areas that has not been understood as well as it could have been. On EE the two options put forward that you either have a requirement of what measures you need to have put in place or additionally a link with EE into deeming. The issues with deeming is that we are proposing that you get the amount of compensation based on the deemed heat consumption of a property and if you do that then that in and of itself should incentivise EE or at least it wont reward, or at least it wont reward energy inefficiency. So if you base the heat load of the house on what you consider to be a reasonable amount of EE and that is what people get paid as a support amount, someone who has a very inefficient house with a higher heat load therefore would not get more support, so they are disincentives. Someone who is able to deliver higher EE is incentivized more because they would get the same amount of support. So, the proposal in the consultation document to, at least at eh smaller scale base the RHI on deemed amounts would we believe certainly create a link with EE but as I said there is an option to additionally also combine that an EE requirement.

James

Where do you think the low hanging fruit is for the RHI

Respondent

Well low hanging fruit is a controversial term in and of itself...because you have to ask yourself to what extent it is enough to get the low hanging fruit because if you pursue that then essentially, I guess you mean the easiest to install; so you would also typically talk about the cheapest to install.....if you apply the philosophy to install the cheapest to install first and therefore at the lowest tariff level then its gets squeezed more in terms of trying to meet targets you go to other options, more expensive options. Then you have to raise tariffs. If you look at that conceptually that has a possible disadvantage in that you actually encourage wait and see behavior. People would know that eventually the tariffs are going to go up, they will typically want to wait until that happens and so the most successful schemes have been the ones that provide the opposite. When tariffs start higher and then go down either by means of digression or reviews. So I think that it is certainly important to flag that. If you talk about low hanging fruit, its is important to clarify what you mean by that.....So having said that means that, as a first point the RHI is proposed to provide a relatively comprehensive set of incentives across the board and that’s not so much specifically because of the reasons that I just mentioned...but because we know that if you are trying to meet the overall RE target you will need quite a lot of effort, it’s a very ambitious target and RES-H we would expect would need to play a significant part in that target and in order to deliver that in a decade or even effectively slightly less, you need to have some pretty credible and comprehensive incentives in place. That means that the RHI as proposed is not trying to cherry pick lowest hanging fruit but having said that...there are in a way of course lowest hanging fruit which is a typically larger scale more cost effective projects where on the one hand you’ve got he advantage of lower cost per unit of energy, whilst on the other hand, you at least hopefully also have the advantage that you are dealing with more professional investors who might respond more rationally to the right incentives and actually go forward with a project based on the incentive rather that on the domestic sector where you might not really know how the public will react to an incentive....so our modeling certainly suggests that by-far the greatest part of delivery of the RHI would
have to come from the large scale sector.

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<th>James</th>
<th>My research has certainly found that there seems to be a lot of interest from this sector.</th>
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<td>Respondent</td>
<td>Yes well we will have to wait and see, but that is certainly what the evidence seems to suggest… and so the RHI is absolutely focusing on that but at the same time as I said, the proposals have been designed to provide wide ranging incentives.</td>
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<th>James</th>
<th>If the small scale domestic, rural, FP market who are, often on an oil or wood-burning system; if they do become left behind initially… as tariff levels eventually decrease if targets are being met with large scale industrial projects, what will happen to this market?</th>
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<td>Respondent</td>
<td>Well I would not like you to take away that conclusion from what I have just said… the RHI proposals have been design to be wide ranging including tariffs for the domestic sector so at this point there is not an indication that if the RHI was to come in along this route that the RHI would be leaving anyone behind so I would certainly not imply that.</td>
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<tr>
<th>James</th>
<th>Obviously in policy there are always areas that suffer because it is almost impossible to design policy that can encompass every problem, but specifically in the SW it seems to be something that people are quite concerned about.</th>
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<td>Respondent</td>
<td>One of the things that has definitely been under review after the consultation is obviously the tariff levels in response to the consultation at all scales including the domestic scale so the process is under way to review that feedback and the additional evidence that we have been receiving. With a view to establishing whether the proposed tariff levels are appropriate including the domestic sector. I cant comment on the outcome of that, but if tariff levels ultimately turn out to be appropriate based on the evidence then that should allow the domestic sector to play its part on that as well. Again, recognizing the particular difficulties in the FP sector, but there also coming back to what you said earlier about the role of third party organisations in that stalk as well. If we are talking about oil fired heating and other off-grid applications it is important to recognize that those are typically more expensive that the average anyway. The tariffs do not distinguish between the counterfactual fuel, so whether you start from gas or oil or coal and so that means that comparatively, people on oil fired heating including whether they are FP, would be in a better situation in respect to the potential savings on their energy bills if moving to a RES-H system.</td>
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<th>James</th>
<th>I think that’s it!</th>
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<td>Respondent</td>
<td>You have covered quite a lot of ground!</td>
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<td>James</td>
<td>Good! One more thing then? Is there anything that you would like to say about the RHI that I have not mentioned? If you think that I have missed something that I have not asked you about can you ask yourself??</td>
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<tr>
<td>Respondent</td>
<td>It think that it is very important to distinguish between market barriers and policy design challenges… for instance how do you deal with the perverse incentives. This is very important.</td>
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