RENEWABLE HEAT INCENTIVE FOR NORTHERN IRELAND

A REPORT FOR THE DEPARTMENT OF ENTERPRISE, TRADE AND INVESTMENT (DETI)

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Progress Report

ORIGINAL

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EXECUTIVE SUMMARY

[to be completed]

1. INTRODUCTION

This report was commissioned by the Department of Enterprise Trade and Investment (DETI) in Northern Ireland, to consider the options for a Renewable Heat Incentive (RHI) for Northern Ireland and to make an initial recommendation.

This final recommendation will represent what we believe to be the most effective approach to contribute towards the 2020 target for ten percent of energy consumption for heating and cooling being met by renewables, given the financial support available. DETI will then consult on this recommended approach before reaching its own view on the implementation of any package that might include an RHI.

Over the course of this study, we will develop and assess a series of possible ways in which a renewable heat incentive might be applied, following the steps set out in the Northern Ireland Guide to Expenditure Appraisal and Evaluation (NIGEAE) guidelines.

Our final report will similarly be structured around these steps. The aim of this initial report is to explore some of the initial steps in this process. In particular, we begin by considering the strategic and policy context within which the RHI is to be applied. This includes both EU and UK framework legislation, as well as specific Northern Ireland considerations, that will need to frame and structure how incentives will work within the RHI. Issues surrounding the roll-out of the gas network are specifically considered.

We then turn to technology specific issues. Over the course of the study it will be necessary to undertake some detailed analysis on the various cost structures and required levels of financial support required to make different technologies financially viable (although not necessarily financeable). This detailed work is ongoing and is not at a point where it might be included within the report at this stage; Annex B shows the information we will provide for each technology. However, we do specifically consider whether there is a case for any support for bio-liquids might differ from that applied in the rest of the UK.

The starting point for the development of options is to consider the "what", "who" and "how" of subsidy design, in terms of technologies supported, eligible beneficiaries and the different ways in which support might be awarded. We then set out a number of different options which fall out of this framework. These are not meant to be exclusive, but have been developed initially to provide a basis for discussion with DETI to see what types of approaches might be acceptable. To aid these discussions, we have provided a number of potential assessment criteria and an initial high level assessment of each. Through this we would wish to ascertain which types of approach might be acceptable and which would not.

Following discussions with DETI, the objective will be to undertake a more detailed cost benefit analyses of preferred options and their variants, taking into account the cost aspects being investigated.

1.1. Supporting policies

In addition to the pure RHI, there are a number of supporting polices that could be introduced alongside the monetary incentives:

- introduction of building standards such that new buildings would have to justify not having renewable heating;
- requirement on fuel suppliers to source at least a certain percentage of their fuel from renewable sources (the key difficulty is likely to be monitoring);
- building the technical capacity of heating engineers to install and inform on the benefits of renewable heating, perhaps through subsidised training courses; and
- a requirement for public sector to convert buildings either with or without subsidy.

The focus of this report is an RHI and so we do not consider further the specifics of these potential policies.

1.2. Report structure

Following this Introduction:

- In Section 2, we discuss the strategic and policy framework within which the RHI is being developed.
- In Section 3, we summarise issues relating to the potential role of bio-fuels within the RHI (recognising that this section will be extended considerably within the next report to cover detailed cost and other eligibility issues related to different technologies).
- In Section 4, we develop a framework for developing options for the RHI, together with a number of options which fall within this framework and which are then initially assessed, against some high level criteria.
- In Section 5, we set out our next steps in terms of how the study will be taken forward.

At this point, Annex A and Annex B are placeholders for details on the financial model to be developed and for details on technology issues, respectively; whereas Annex C provides detailed cost issues associated with bio-liquids.

2. Strategic and Policy Context

This section sets out the strategic context for renewable heating and the rationale for government intervention in the area.

2.1. The strategic context for renewable heat

Developing proposals to increase the role of renewables in heating and cooling, is necessarily framed within current legal requirements and informed by lessons from previous and concurrent policies in the UK and Republic of Ireland. This subsection addresses each consideration in turn.

2.1.1. The requirement for renewable energy

Through European Directive 2009/28/EC[1] (The EU Renewable Energy Directive) the EU has committed itself to sourcing 20 percent of its energy needs from renewable sources by 2020. The directive requires Member States to achieve mandatory overall targets, but allows this to be achieved in any combination across three sectors:

- energy from renewable sources for heating and cooling;
- electricity from renewable energy sources; and
- energy from renewable sources in transport.

The UK's overall target is set at 15 percent. While the government has not committed to a particular sector mix, the "lead scenario" in DECC's Renewable Energy Strategy[2] envisages the overall target being met through renewables fulfilling:

- 12 percent of heating and cooling needs;
- more than 30 percent of electricity demand (29 percent large and 2 percent small-scale electricity generation); and
- 10 percent of transport energy needs.

The Renewable Energy Directive is not directly binding on devolved administrations but renewable deployment in all regions contributes equally to the requirements placed on the UK under the Renewable Energy Directive.[3] In September 2010, DETI committed to achieving a renewable heat target of ten percent by 2020 in its Strategic Energy Framework.[4]

While achieving the 2020 target will requires a significant change in how our energy needs are met, it is only a small part of the way towards the target of reducing greenhouse gas emissions to 80 percent below 1990 levels by 2050, as required by the 2008 Climate Change Act.

[1] DIRECTIVE 2009/28/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 23 April 2009 on the promotion of the use of energy from renewable sources http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:140:0016:0062:EN:PDF

[2] http://www.decc.gov.uk/en/content/cms/what_we_do/uk_supply/energy_mix/renewable/res/res.aspx

[3] While this target is two percentage points below that for the UK as a whole, the Northern Ireland commitment to 40 percent renewable electricity generation is ten percentage points higher than DECC's commitment for the UK as a whole.

[4] DETI (2010) "A Strategic Framework for Northern Ireland" http://www.detini.gov.uk/deti-energy-index/deti-energy-strategic-energy-framework.htm

2.1.2. Renewable heat policy in the British Isles

Beginning with Great Britain, we consider renewable heat policies throughout the British Isles.

Great Britain

The previous UK Government committed to a GB Renewable Heat Incentive (RHI) starting in April 2011 that would subsidise new renewable heat installations sufficient to achieve the level in the lead scenario. The Energy Act 2008[5] was passed in November 2008 to implement the legislative requirements of the 2007 Energy White Paper.[6] This set the parameters for renewables heat incentives in GB,[7] including new powers for the Secretary of State to "*establish a financial support programme for renewable heat generated anywhere, from large industrial sites to individual households*." Early plans for the GB RHI included using these powers to finance the programme through a levy on fossil fuel suppliers.

The current UK Government announced in the October Spending Review[8] that the incentive will now start in June 2011, will be funded from DECC's budget, and will represent over £860m of investment between now and 2015. [9] DECC has previously consulted[10] on the detail of a RHI to be implemented from June 2011; revised proposals are expected shortly. The incentive will apply to eligible renewable heat installations in England, Scotland and Wales, cover a wide range of technologies[11] and cater to a range of "investor" types.[12]

DECC's RHI has been presented as a "clean energy cash-back" scheme paid to the owner of new renewable heat equipment.[13] Its purpose is to help achieve the target of 12 percent of heating and cooling demands to be generated from renewable sources by 2020.

The RHI is designed to encourage take-up of renewable heat technology by bridging the financial gap between renewable and conventional methods of heating. Owners of eligible installations will receive support for both the upfront and ongoing costs of moving to renewable heating compared to an assumed existing technology.[14] Domestic gas combustion is the assumed incumbent in most cases, with variations for bio-liquids and small-scale biomass where fossil fuels such as heating oil or coal are the assumed counterfactual.

[5] Energy Act 2008, Part 5, Renewable Heat Incentives, Given Royal Assent 26th November 2008 http://www.legislation.gov.uk/ukpga/2008/32/part/5/crossheading/renewable-heat-incentives

[6] HM Government (2007) "Meeting the Energy Challenge: A White Paper on Energy" Department of Trade and Industry http://www.berr.gov.uk/files/file39387.pdf

[7] While a number of sections of the Act apply to Northern Ireland, the section on Renewable Heat does not.

[8] http://www.hm-treasury.gov.uk/spend_sr2010_documents.htm

[9] The 2010 Spending review introduced "efficiency savings of 20 per cent, or £105 million a year, by 2014-15 compared with the previous government's plans."

[10] http://www.decc.gov.uk/assets/decc/Consultations/RHI/1_20100204094844_e_@@_ConsultationonRenewableHeatIncentive.pdf

[11] The scheme is likely to cover air, water and ground-source heat pumps, geothermal energy, solar thermal, biomass boilers, renewable combined heat and power, biogas, bioliquids and biomethane. Notable exclusions are likely to include wood burning stoves, air heaters and open fires due to monitoring difficulties.

[12] HM Treasury (2010) "Spending Review 2010" http://cdn.hm-treasury.gov.uk/sr2010_completereport.pdf

[13] Installations completed since 15th July 2009 as if installed on the first day of the scheme going live.

[14] Some support is also likely to be given for some non-financial barriers including the excavation of gardens required to install heat pumps.

The tariff payments, to be administered by Ofgem, will be paid periodically over the expected useful life of the equipment. These will be contingent on evidence of the continued use and maintenance of the equipment. It is likely that once installed, a particular installation will receive a guaranteed stream of payments, with levels changing over time for new projects based on new information on costs and take-up rates.

Most tariffs proposed are set at a level to cover the difference with conventional heat at different scales plus an annual investment return to reflect the effort, risk and opportunity cost of capital involved. A 12 percent return will be paid on most technologies, with a lower rate of six percent for solar thermal technology given its relative maturity.[15] Returns are set at a higher level than implied in electricity feed-in tariffs to reflect the magnitude of change required to meet the 2020 targets. Details of the current proposed tariffs and banding are summarised in Table 2.1 below.

Table 2.1: DECC RHI consultation table of tariffs

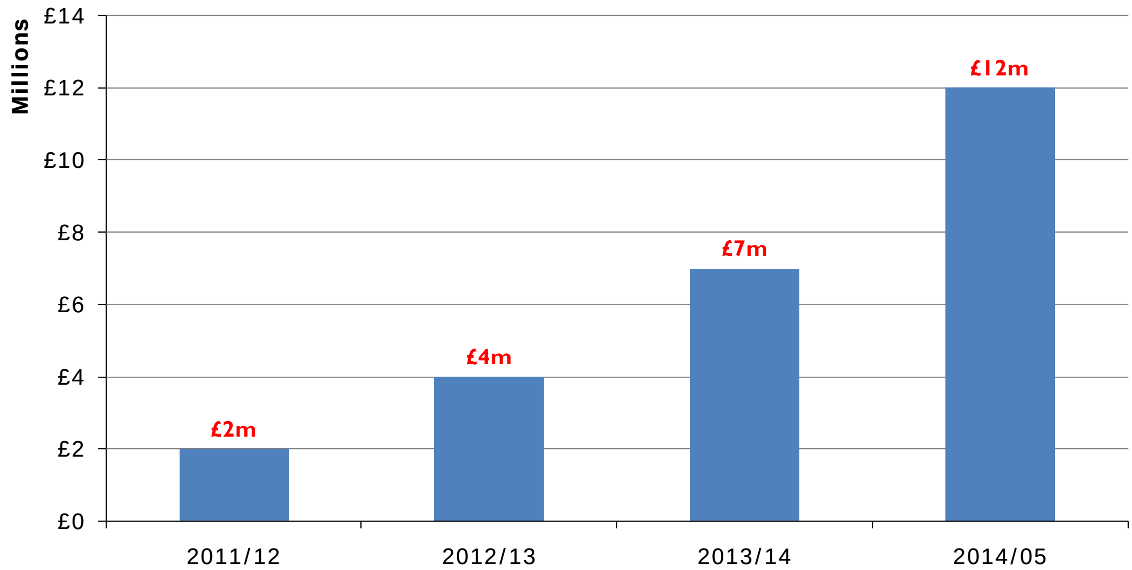
Technology	Scale	Proposed tariff (pence/kWh)	Deemed or metered	Tariff lifetime (years)	Implied rate of return
Small installations					
Solid biomass	≤ 45kW	9	Deemed	15	12%
Bio-liquids	≤ 45kW	6.5	Deemed	15	12%
Biogas on-site combustion	≤ 45kW	5.5	Deemed	10	12%
Ground source heat pumps	≤ 40kW	7	Deemed	23	12%
Air source heat pumps	≤ 45kW	7.5	Deemed	18	12%
Solar thermal	≤ 20k	18	Deemed	20	6%
Medium installations					
Solid biomass	45-500kW	6.5	Deemed	15	12%
		2 (fuel tariff)	Optional: for metered kWh above deemed number of kW	15	12%
Biogas on-site combustion	45-200kW	5.5	Deemed	10	12%
Ground source heat pumps	45-350kW	5.5	Deemed	20	12%
Air source heat pumps	45-350kW	2	Deemed	20	12%
Solar thermal	20-100kW	17	Deemed	20	6%
Large installations					
Solid biomass	≥ 500kW	1.6-2.5	Metered	15	12%
Ground source heat pumps	≥ 35kW	1.5	Metered	20	12%
Bio-methane injection					
Bio-methane injection	All scales	4	Metered	15	Na

[15] Biomethane support is set based on parity with feed-in tariffs rather than a specified rate of return.

Northern Ireland

As shown in Figure 2.1, HM Treasury has ring-fenced £25m over 2011/12 to 2014/15 for DETI for the sole purpose of funding a renewable heat incentive. A previous scoping study[16] indicated that the 2020 renewable heat target would be achievable within this funding envelope (although with a variety of measures driving renewable heat rather than just an RHI). Energy minister Arlene Foster indicated that if one is shown to be economically viable, a Northern Irish RHI will be put in place.[17]

Figure 2.1: HM Treasury funding profile



A Northern Ireland RHI would not be the first policy to support the roll out of renewable technology in the country. Previously, householders could obtain grants to install renewable energy technologies, including renewable heating, through the "Reconnect" and the "Low Carbon Buildings" [18] programmes. Both of these have now closed.

The Reconnect programme was the subject of an assessment report[19] for DETI, which noted that although virtually all[20] users of the programme were either satisfied or very satisfied, the administrative complexity and the cost of renewable energy did put off householders. Many of the applications were also for more expensive technologies. The assessment also noted that "*any further government support for domestic micro-generation will deliver only a small fraction of what is required to meet the broader NI policy objectives relating to 'security of supply', 'CO2 reductions' and the proportion of electricity to be generated from indigenous renewable sources.*". A list of the key recommendations can be found in Box 2.1 below. A report by the Northern Ireland Assembly suggested that "*The*

[16] AECOM & Pöyry (2010) "Assessment of the Potential Development of Renewable Heat in Northern Ireland" Prepared for DETI. Executive summary available at http://www.detini.gov.uk/executive_summary_-_renewable_heat_study

[17] http://www.utilityweek.co.uk/news/news_story.asp?id=177206&channel=0&title=Northern+Ireland+minister+supports+Renewable+Heat+Incentive+as+report+uncovers+potential

[18] www.lowcarbonbuildings.org.uk

[19] [insert link to KMPG review of Reconnect]

[20] 96%

Department's reason for discontinuing the Scheme was that it was mainly taken up by more affluent rural households and did little to help those in fuel poverty."[21].

Box 2.1: Recommendations from Reconnect assessment
Recommendation 1: Given its cross cutting nature and in the context of wider energy policy development, we recommend that before deciding whether or not to introduce any follow-on support for domestic micro-generation that DETI seeks Executive agreement on future policy objectives for micro-generation support.
Recommendation 2: The Executive should only agree to provide follow-on support for domestic micro-generation if such support is found to be more cost-effective relative to potential support for other types of renewable energy installation.
Recommendation 3: If the Executive agrees that future funding for domestic micro-generation projects is a necessary intervention, then it is recommended that any future support for micro-generation should be in the context of a 'whole house approach' and therefore minimum standards of energy efficiency must be attained either before or, in conjunction with the installation of domestic micro-generation technologies.
Recommendation 4: In order to allow sufficient time to install their renewable device, the responsible Government Department and/or delivery agent should co-ordinate with householders in relation to specific planning issues. As a result, the Letters of Offer from any potential future programme should be variable (within a reasonable timeframe) based on the type of technology being installed.
Recommendation 5: The focus of any potential future support should be on those devices that have demonstrated the greatest Value for Money for government spending. In broad terms, the level of support that individual technologies attract should be linked to the benefits that those technologies bring (whether in terms of environmental benefits or in terms of security of supply).

Source: [KPMG report on Reconnect]

The Low Carbon Buildings Programme was a UK-wide programme supporting micro-generation technologies. It was open to applicants for three years from 2006, providing a total of £86m of grant funding to householders, the public sector and charitable organisations. Qualifying recipients were required to take steps to ensure that they met energy efficiency standards before funding was provided, potentially up to £200,000 in grant funds per site.[22]

In addition to these policies, quality assurance of renewable technology installation capacity has been aided through the DETI supported database of installers for renewable technologies, called the Renewable Energy Installers Academy.[23]

As well as its target for renewable heat, Northern Ireland has a target of 40% of electricity from renewable sources by 2020. Achieving the 40% electricity target is likely to both increase electricity bills and reduce the carbon intensity of electricity. The former effect will make electric heating, and heat pumps, relatively more expensive, while the latter will make them more attractive from a carbon dioxide emissions point of view.

This stretching target could also lead to an increased demand for biomass for electricity production, which would make biomass less available for renewable heat. Current biomass

[21] http://www.niassembly.gov.uk/enterprise/2007mandate/reports/2010/Report_14_10_11R_v1.htm#5, paragraph 27

[22] [Source: Low Carbon Buildings Programme website]

[23] http://www.reiaadmin.org/

resources in Northern Ireland are limited to around 4-5%[24] of heat demand (i.e. not including electricity production) and so this could be a significant constraint. A decision may need to be taken about the best use for the limited available biomass. The AECOM/ Pöyry report[25] argued strongly that "*...the high energy density and easy storage of biofuels means that they should only be used where there are no alternative renewable / low carbon options. Examples include road transport and aviation*".

Republic of Ireland

The EU Renewable Energy Directive requires the Republic of Ireland to meet 16 percent of its energy needs from renewable sources by 2020. This target is one percentage point greater than the UK's requirement, partly reflecting the higher starting level (3.1 percent in Ireland compared to only 1.3 percent in the UK). As show in Table 2.2, the Republic's 2020 heat targets were set at 12 percent, in line with the UK, but slightly above the level targeted in Northern Ireland.

Table 2.2: Sector targets and trajectories

	2010	2015	2020
Heating and cooling	4.3%	8.9%	12.0%
Electricity	20.4%	32.4%	42.5%
Transport	3.0%	5.9%	10.0%
Overall RES Share	6.6%	11.8%	16.0%

The Republic's support for renewable heat has been split across two policies managed by the Sustainable Energy Authority of Ireland (SEAI) utilising upfront grants, rather than a stream of payments as in the draft GB RHI; these are:

- Greener Homes, targeting the household sector; and
- the Renewable Heat Deployment Programme (Reheat), targeting larger consumers and groups.

Greener Homes provides grant support to households purchasing renewable energy heating systems for existing homes. This five year programme supported 31,560 installations from 2006 to the end of 2010. Installation inspections are made on a random basis and verification inspection are a prerequisite of the grant disbursement. Ongoing technical inspections are conducted do not affect payments, instead being used to inform the ongoing quality assurance of the programme. Solar, biomass and heat pump installations may receive grants up to the levels in Table 2.3.

Table 2.3: Maximum Greener Homes Grants[26]

[24] AECOM/ Poyry "*Assessment of the Potential Development of Renewable Heat in Northern Ireland*", April 2010
[25] ibid
[26] SEAI "Greener Homes Scheme Phase III (Existing Dwellings only) Application Guide Version 3.4" http://www.seai.ie/Grants/GreenerHomes/Homeowners/How_to_Apply/Greener_Homes_Application_Guide.pdf

Technology	Maximum grant
Biomass – boiler	€3,000
Biomass – stove	€1,100
Biomass – stove with integrated back boiler	€1,800
Heat Pump – vertical ground	€3,500
Heat Pump –horizontal ground	€2,500
Heat Pump – water to water	€2,500
Heat Pump –air source	€2,000
Solar – flat plate	€250/m² (to max of 6m²)
Solar – evacuated tube	€350/m² (to max of 6m²)

The ReHeat programme, launched in March 2007, was open to applicants for plants within the Republic of Ireland intending to retrofit or install new renewable energy heating system in buildings owned or operated by industrial, commercial, services or public sector or community organisations. Energy Supply Companies (ESCOs) were also eligible to apply. This programme provided grants for feasibility studies or capital investment grants. The former grant is capped at 40% or €5,000 (whichever is less) per study with an overall allocation of €300,000. Capital investment grants were limited to wood chips and/or wood pellets automatic biomass boiler, solar thermal heating systems and heat pump systems which use ground source, ground water or air to water. Funding for these projects was limited to the lower of 30 percent of the submitted costs or 30 percent of the maximum capacity cost range. The maximum capacity cost range differs depending on the plant scale and technology used.[27] Grants were paid directly to the applicant once contractors were paid and the satisfactory inspection of documentation. As with the Greener Homes Scheme, SEAI reserved the right to verify and/or make technical inspections at its discretion.

While €65m was committed in 2006 and a further €4m in 2007, the programme received no funding in the 2011 budget and thus was closed to new applicants. Despite the lack of direct support for renewable heating, policies are currently in place to encourage the use of biofuels across all sectors although primarily in industrial use. The Renewable Energy Feed-In Tariff (REFIT), Bio-Energy Establishment Scheme, and Combined Heat & Power Scheme all provide support for the use of biofuels. In 2009, around 1.5TWh[28] of renewable heat was consumed by industry, approximated 66 percent of overall renewable heat consumption.[29]

[27]http://www.seai.ie/Grants/Renewable_Heat_Deployment_Programme/ReHeat%20Application%20Guide%20Ver1_5.pdf

[28] 130,000 toe

[29]http://www.seai.ie/Publications/Statistics_Publications/SEI_Renewable_Energy_2010_Update/RE_in_Ire_2010update.pdf

2.2. The Northern Ireland context

The UK as a whole generates around 2% of its heat from renewable sources; the figure for Northern Ireland is 1.7%. Most of the existing renewable heat in Northern Ireland is from biomass, with small additional contributions from heat pumps and solar thermal.

Total heat demand in Northern Ireland is 17.4TWh per year, of which 61% is from the domestic sector and 22% is from the large industrial sector. Previous work for DETI has identified that a Renewable Heat Incentive (RHI), that could potentially cover all consumers of heat, could be a useful part of the policy package for delivering renewable heat. Other options included more targeted support for the large industrial sector, for development of biogas, and updating the requirements for new buildings. An RHI would need to sit alongside and be consistent with these other options, if they were chosen.

Northern Ireland's specific current circumstances must be taken into account, particularly the current fuel mix for heating, in which over 80% of heating is from oil. This mix varies by region, and could affect both the carbon benefit of shifting to renewable fuel and the cost of doing so, because for example of the relative cost of converting existing oil-fired heating equipment to use biofuel, compared to the cost of converting gas-fired heating.

This fuel mix is quite different to that in the rest of the UK which relies largely on natural gas for heating. This raises a number of implications for a study of incentives for promoting the uptake of renewable heat, including:

- The funding arrangements for natural gas distribution networks in Northern Ireland have been structured on the assumption that consumption volumes will grow as more customers switch from oil as a heating fuel to natural gas.
- The counterfactual heating technology in Northern Ireland can be different to GB and therefore the outcomes of an economic appraisal of the appropriate structure of a Northern Ireland may also be very different.

In addition, there are also potential implications for renewables policies associated with the extent of fuel poverty in Northern Ireland, as set out in Box 2.2.

Box 2.2: Fuel Poverty in Northern Ireland[30]

The "Fuel poverty ratio" is defined as: Fuel poverty ratio = fuel costs (usage x price) ÷ income. If a household spends more than 10% of income on energy to maintain a satisfactory heating regime (21 degrees for main living area and 18 degrees for other occupied rooms), then it is said to be in fuel poverty.

Fuel Poverty varies across the countries of the UK and also within smaller regions. Looking at the larger picture in 2009 the Northern Irish percentage of households that were fuel poor stood at 43.7% which is the highest of all UK nations. Next was Scotland at 32.7%, then Wales at 26% and finally England at 15.6%. On the other hand, the proportion of social housing is relatively low. Social housing provided by local authorities (or equivalent) and other social landlords was 14.9% of the dwellings stock in 2009. This compared to 17.8% in England,

[30] [Source]

Box 2.2: Fuel Poverty in Northern Ireland[30]
16.0% in Wales and 24.1% in Scotland. *Fuel Poverty and Warm Homes* The Warm Homes and Warm Homes Plus Schemes first introduced by the Department for Social Development in 2001 to tackle fuel poverty through improving energy efficiency of privately owned or rented accommodation where householders are in receipt of certain qualifying benefits. Qualifying Warmer Homes applicants may receive grants of up to £850 for the installation of certain types of insulation. Warmer Homes Plus provides grants of up to £4,300 for the installation of oil or gas heating systems, where there is currently none in place, or the conversion of bottled LPG, solid fuel or Economy 7 system to oil or natural gas. In April 2009, when the policy was re-launched, the Social Development Minister announced that over 70,000 had benefited from the scheme[31].

2.2.1. Heating oil in Northern Ireland

This section will be expanded following conversations with industry. This will include an overview of the supply chain and any issues relevant to renewable heating.

Size of sector

OFTEC (OFTEC 2010) estimate that oil is used in approximately 500,000 homes in NI, and the average kerosene consumption is 2,008 litres per year. This gives a domestic oil consumption of approximately 1 billion litres per year. Assuming 1 litre of kerosene provides 10.35kWh this gives an energy demand of 10,391 GWh. This is similar to the current domestic oil demand of 9,241 GWh estimated by AECOM (AECOM 2010).

2.2.2. The gas network in Northern Ireland

Overview

Natural gas was first introduced to Northern Ireland in 1996, triggered by the conversion to natural gas of the Ballylumford power station. There are now about 125,000 gas customers in the Greater Belfast, Lisburn and Larne distribution area operated by the Phoenix Natural Gas Group (PNG) who developed the original pipeline system via the Scotland to Northern Ireland (SNIP) transmission pipeline. Belfast Gas Transmission Limited (BGTL) is now the licensed transmission operator to convey gas from the Ballylumford power station to the PNG Greater Belfast and Larne areas, while Premier Transmission Limited (PTL) operates the SNIP pipeline.

Outside Greater Belfast, Firmus Energy is rolling out the gas distribution network from the North-West and South-North gas transmission pipelines constructed by BGE (UK), a subsidiary

[31] NI Direct website "Social Development Minister Margaret Ritchie today launched the new Warm Homes Scheme in Northern Ireland" accessed 18/02/2011 http://www.northernireland.gov.uk/index/media-centre/news-departments/news-dsd/news-dsd-july-2009/news-dsd-290709-ritchie-launches-warm.htm

of Bord Gáis Eireann, in 2004 and 2006 respectively. Firmus Energy has around 5,000 customers, with the aim of having some 60,000 customers within the period of its licence. DETI is also examining the technical and economic issues associated with taking gas to the towns in the north-west and west of Northern Ireland, and is considering extending the gas network to east Down.[32]

Competitive tendering

There is a key difference in the economic circumstances of the Northern Ireland natural gas industry area compared to other gas conveyance areas elsewhere in the UK, and electricity supply in Northern Ireland and the rest of the UK. At privatisation in Great Britain, the gas industry was mature, with over 18 million customers and an existing pipeline system. In contrast Northern Ireland's pipeline system has developed from a green-field state with distribution businesses awarded licences through competitive tendering. Northern Ireland also has less favourable gas sales to capital investment ratios compared to other regions of the UK, with both the existing and potential size for the natural gas market relatively small as a result of the dispersed locations of settlements and the small population.

As we discuss below, the incremental growth of the industry and the competitive tendering process for developing the main-line pipe systems has impacted on the approach to regulation of the sector, in particular, the price setting process for the infrastructure assets and services. As is illustrated in Table 2.4 below, the tendering process and the economics of different distribution licence areas in and around Greater Belfast has also impacted significantly on the business models of Northern Ireland's gas transmission and distribution companies.

Table 2.4: Network ownership and gas business models in Northern Ireland

	PTL Tran	**BGTL**	**BGE UK**	**Firmus**	**PNG**
Ownership	Mutualised assets [a]	Mutualised assets [a]	Private [b]	Private	Private
			Irish Gov.	Bord Gáis Eireann	Kellen Acquisitions [c]
Functions	TSO	TSO	TSO	'Net-back' agreement between supply and distribution	Separate distribution business
Customer base	Onshore network	Generators and distribution	Generators and distribution	Mainly I&C customers	I&C and domestic customers

Note: [a] *Mutualised assets owned by Northern Ireland Energy Holdings (NIEH).*

Note: [b] *State-owned gas network operator in the Republic of Ireland.*

[32] DETI: 'A Draft Strategic Energy Framework for Northern Ireland', July 2009

Note. [c] Company formed at the direction of Terra Firma, a private equity manager.

The Northern Ireland natural gas industry has had to balance pricing gas competitively into the Northern Ireland energy market with the need for investors to recover a reasonable risk adjusted rate of return. The overall approach has been to price to what the market can support, whilst seeking to grow volumes and connections as quickly as possible to increase the customer base from which industry costs are recovered. An intrinsic part of the growth strategy has been to establish customer and public confidence that prices will remain acceptable once customers have been converted to natural gas, while also providing a secure long term investment environment for investors. The price of other fuels (in particular oil) has also played a significant role in the price setting process. Oil continues to act as a competitive constraint on pricing in certain areas and for some customer groups.

Gas volumes and demand

Historical Northern Ireland gas demand is summarised in Table 2.5. The distribution category includes the gas demand of PNG and Firmus Energy, while the power sector includes the Ballylumford and Coolkeeragh power stations. The total Northern Ireland annual demand has grown by 31.7% over the period 2002/03 – 2008/09 (or 4.5% p.a.).

Table 2.5: Historic NI annual demand summarised by sector

Sample	Unit	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09
Energy								
Power	GWh/y	9,880.9	9,902.8	13,769.6	14,921.6	15,695.6	14,248.8	12,488.9
Distribution	GWh/y	2,766.2	3,040.4	3,208.8	3,326.9	3,393.8	3,923.3	4,161.3
Total NI	GWh/y	12,647.2	12,943.2	16,978.4	18,248.5	19,089.4	18,172.1	16,650.2
Volume								
Power	mscm/y	889.3	891.2	1,239.3	1,342.9	1,412.6	1,292.4	1,128.4
Distribution	mscm/y	249.0	273.6	288.8	299.4	305.4	355.9	376.0
Total NI	mscm/y	1,138.3	1,164.8	1,528.1	1,642.3	1,718.0	1,648.3	1,504.4

Source: CER/NIAUR (2010): Gas capacity statement

Northern Ireland's small population limits the volumes of gas required in the region. Given the high cost of gas transmission and distribution pipelines is usually recovered across very large volumes of gas, the extension of the gas transmission system in Northern Ireland has in general not been commercially viable. Projects have therefore only been feasible with support and the postalisation of gas transportation tariffs in the region.

Extending the gas network

The development of Northern Ireland's gas infrastructure is an ongoing process, and there are now opportunities to further extend gas transmission and distribution areas in the North-West and West of Northern Ireland, to towns such as Strabane, Omagh, Magherafelt, Cookstown Dungannon, and Enniskillen. As mentioned in the Strategic Energy Framework, DETI is also aware of interest in extending the gas network into east Down. How, when or whether this infrastructure is rolled-out, is dependent upon the technical feasibility of bringing gas to these towns, as well as there being a suitably strong economic case to warrant the investment.

We will expand this section following a conversation with Sarah Brady at NIAUR, scheduled for 22nd February, and on receipt of further information from Fred Frazer at DETI.

2.2.3. Potential for renewable heat in Northern Ireland

DETI recently commissioned a study of the potential for renewable heat in Northern Ireland. This report presented statistics on both the current status and future potential for renewable heat compared to other countries. This study provided the basis for the subsequent commitment to a ten percent target and laid the groundwork for options to incentivise this rollout. Table 2.6 provides the summary of conclusions from that report.

Table: 2.6: AECOM/Pöyry summary of the potential and costs of delivering renewable heat through the various delivery mechanisms

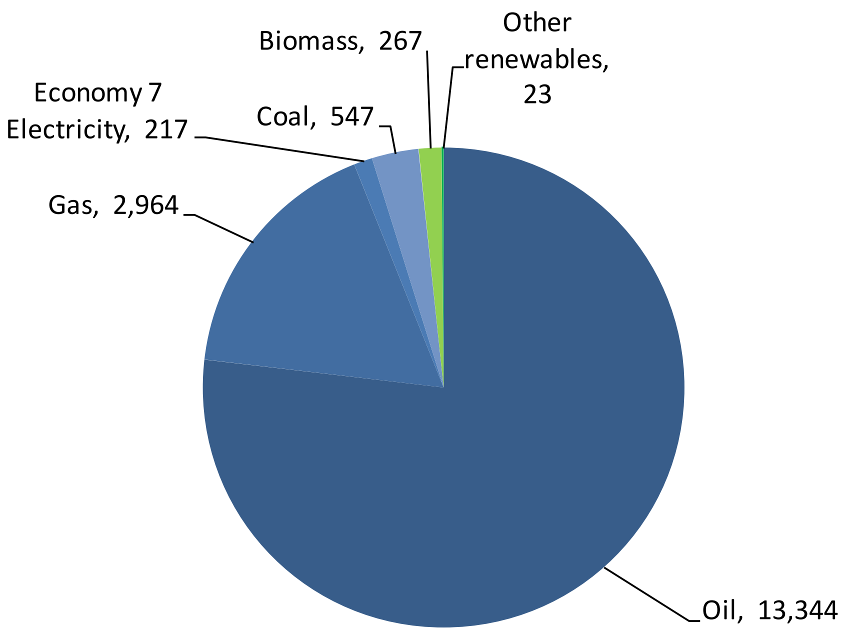
Renewable heat delivery	Potential (percentage Renewable Heat by 2020)	Impact on targets	Annual incentive required (£m per one percent renewable heat target)
Large industrial sector	Further analysis required but possible a significant potential.	The small number of applications and unknown viability means these applications should not be included in setting targets.	Unknown. Large scale energy consumers could mean that some of these applications are cost effective in the 2020 period.
Building scale	10% or more.	The analysis demonstrates that a 10% RH target is achievable using building scale technologies.	£2.5m per % to achieve 10%. £8.8 m per 1% above 10%. No cost below 6%.
District heating	Further analysis required but preliminary assessment suggests circa 30%. Potential by 2020 extremely limited unless significant shift in policy and regulation.	Potential for district heating should not contribute to setting a 2020 target due to long term development and barriers.	Up to £9.4 - £11.5 m Some areas may be cost effective if sufficient uptake can be achieved.
Biogas	0.8% - 1.4% depending on biogas or CHP. Further potential in the longer term by approx 10 times	Potential for circa 1% contribution to target setting depending on further analysis.	£8.2m per 1% for biogas. £11.8 million per 1% for AD CHP.
New development	0 – 4.9%	Other drivers will be more important in this sector. It is important that building regulations are consistent with other renewable heat policies.	Zero cost in terms of incentives if driven through regulation.

Source: AECOM & Pöyry[33]

2.3. The need for Government intervention

Previous modelling for DETI estimated the mix of fuels used for heating purposes in Northern Ireland in 2010. Figure 2.3 illustrates this split.

Figure 2.3: Estimated 2010 heating fuel mix (MWh)



Source: Aecom / Pöyry data

The same study examined a baseline scenario where no financial support was provided to support the roll-out of renewables. This showed that while the share of renewables will expand of its own accord as technologies become viable in their own right, it will fall short of ten percent without government intervention. Only four percent is expected to be commercially viable without support. This would be expected to largely come from the use of biomass in the commercial and public sectors, mainly after 2015 as the cost of biomass and CHP become more favourable compared to forecast rising costs of conventional technologies. However, even this result is sensitive to assumptions on the technologies' relative and absolute cost, and further un-modelled barriers to take up.

Previous modelling appears to show that without support, it is highly unlikely that Northern Ireland will come even close to achieving its renewable heating target. Consequently some form of support scheme is required to achieve this goal.

[33] AECOM & Pöyry (2010) "Assessment of the Potential Development of Renewable Heat in Northern Ireland: Final Report" for Department of Enterprise, Trade, and Investment p5

3. RENEWABLE HEAT TECHNOLOGIES

A further necessary input into the analysis, is an assessment of the range of potential renewable heat technologies that might be supported under the RHI; and moreover, whether any might be relatively more appropriate to the Northern Ireland context. It is also important to consider the potential for and different costs associated with the deployment of a given technology. Annex B outlines the information we will provide for each technology.

While much of this work is ongoing, in this initial report, we specifically consider the role of bio-liquids and the issues associated with their use in Northern Ireland. This is summarised below, and the issue is explored in greater detail in Annex C.

3.1. Bio-liquids

Given the high proportion of oil used for heating in Northern Ireland, we have looked specifically at the possibility of using bio-liquids to replace some of the fossil fuel-based oil currently used. In summary:

- Greenhouse gas emissions savings are low relative to a wood-fired boiler:
  - Using 100% biodiesel from waste oils/ tallow in domestic heating boilers potentially has good GHG emissions savings, about 82%. However, if the biodiesel component is limited to 30%, for operational reasons, then the GHG emissions savings in each installation are reduced to 25%.
  - For comparison, a B30 blend of biodiesel meeting the minimum GHG emissions savings to meet the requirements of the Renewable Energy Directive (RED) of 35%, yields a GHG emissions saving per installation of 10.5%.
  - The GHG emissions savings may be further reduced if the converted boiler has a lower efficiency than modern oil boilers.
  - For comparison purposes, a pellet boiler using clean waste wood as feedstock has a GHG emissions saving of about 92% for each installation.
- B30 is not a 'drop in fuel'. The boiler must be adapted to use B30, and cannot then be easily changed back to operation on 100% fossil oil.
- There will be stiff competition for biodiesel from the road transport sector. In particular biodiesel from UCO/tallow will be in demand because of its good sustainability characteristics and high emissions savings. There is therefore likely to be a problem with availability of biodiesel from UCO/ tallow at an acceptable price in the heating market.
- Recent studies suggest that the retail price for wood pellets is slightly higher than for heating oil, and that the price of biodiesel is substantially higher than both, on a £/GJ basis. The price of biodiesel is tracking the diesel price, and it is not yet clear how the price of wood pellets will relate to the fossil fuel prices.
- If applications using bio-liquids are eligible for inclusion in the RHI, then a scheme to monitor and verify sustainability and greenhouse gas emissions savings will be required

to comply with the RED. The current model in the transport sector places the responsibility for these issues with the fossil fuel supplier.

Our overall, be it initial, conclusion is that the issues, advantages and disadvantages of supporting bioliquids do not differ markedly between NI and GB. As such, there does not therefore seem to be a case for deviating from the GB position. The higher proportion of oil fired equipment in NI does, however, offer the prospect of a rapid take up at minimal initial cost which would support the fuel poverty alleviation and social inclusion policies by allowing poorer households to share the benefit and participate. The greenhouse gas savings are critical to value for money however and a method of ensuring that only waste derived materials are used is needed to prevent very high costs of abatement and potential negative impact.

4. OPTION DESIGN

In this section we consider how options might be developed. We begin by considering the objectives of the RHI in Northern Ireland and some of the implication that this gives rise to for option design. We then consider a framework for developing options, comprising a number of primary and secondary parameters. It is the different combinations of the primary parameters, and to a lesser extent the secondary, that help determine potential options. We then set out a number of indicative options, representing various choices within this framework, before outlining some of the assessment criteria that might be used to evaluate and prioritise them. Finally, we apply these criteria to provide an initial assessment and emerging conclusions.

4.1. Objectives of the RHI in Northern Ireland

The starting point for designing options is to consider the overall objectives of the RHI in Northern Ireland. DETI has £25m from the Treasury for an RHI for Northern Ireland. The model is allocated for the period 2011/12-2014/15 and cannot be used for any other purpose. We have assumed that there are no restrictions imposed by HMT on the form of a NI RHI, provided the money is used to support renewable heat in Northern Ireland.

The main objective is to use this money to help deliver the target of 10% of heat in Northern Ireland being from renewable sources by 2020. This has to be delivered in a way that is consistent with other DETI policies. We note that the £25m is unlikely to be sufficient to deliver the 10% target on its own (the AECOM report suggests that achieving the target will cost at least £25m in 2020 alone[34]), so is likely to form part of a package of policies.

There are of course different ways in which the target could be met, which will determine how funds might be allocated. For instance, the subsidy might be limited to support an uptake in renewable heating (the numerator of the target), or might it be extended to support a reduction in overall heating use / intensity support (the denominator). This would affect the eligibility of different projects for support; that is, whether eligibility for support should be confined to technologies for renewable heat production, or whether energy saving schemes should also be included.

Over and above this, there are also questions of whether eligibility or allocation of available subsidy support should take into account other potential policy considerations, such as to support the development of particular technologies (in the same way that Renewable Obligation Certificates are now banded to compensate for different scales of the viability gap, or to target particular groups, such as the fuel poor).

All of the objectives discussed above have their merits. However, it is important to be clear what the priorities are in developing the initiative otherwise objectives will become confused. Also, attempting to hit several objectives with only one policy tool can be problematic. Therefore, irrespective of what is chosen, it is important to be clear about these objectives of the initiative and where there are several, how they might rank as it will impact upon the overall scheme design.

[34] AECOM/ Pöyry [title], page 97

4.2. Option parameters and framework

Given the above, there are several routes to the 2020 target. Some could be potentially quicker and cheaper than others, while others might create value by supporting technology development, or reduce the risk of falling short of the target. The shape of intervention in the renewable heat market will need to match DETI's objectives for how the 2020 targets are to be met and its longer-term vision for the rollout of renewable heat technology in Northern Ireland.

At a detailed level, there are perhaps hundreds of possible options that could be developed, but considering them all is unlikely to be fruitful. Instead, we believe it is more insightful to develop options within an overall framework. In doing so it is important to distinguish between the primary design parameters; that is, the factors that create the most significant differences between options, and then secondary considerations.

We therefore take the approach of setting out the high level choices that need to be made. We then, to make the discussion more concrete, set out a few indicative examples of approaches. These allow us to identify the desirable characteristics that policies should have. This should then suggest a number of potentially attractive options that merit detailed assessment.

4.2.1. Primary design parameters

These high level or primary design parameters can be determined by answering questions about how any payments under it would be made, when, to whom, and whether they would be fixed or variable. Issues regarding the supporting administration are dealt with in the next sub-section.

The first set of design parameters are therefore effectively the "what", "who" and "how" of the support regime. This relates to issues of the **technologies** (what) and **beneficiaries** (who); that are eligible for support and which support is targeted on, as well as the way in which (how) subsidy is **awarded**. In each case there are subsidiary issues of the **rules** of allocation and levels of support; that is, how the available subsidy might be allocated between different sub-sets of eligible entity and whether the amount is fixed or variable.

As we will show, it is the different combinations of these parameters that give rise to different options. In discussing these different parameters we will also consider the rationales for given approaches as well as any Northern Ireland specific implications of a given approach.

4.2.2. Technologies supported

As discussed in the objectives, in developing options, a consideration is whether or not different types of technology might have different degrees of support.

Neutrality versus banding

A scheme in which all qualifying technologies are treated the same, without any differential support, can be said to be technology neutral. Alternatively, a scheme which has different bandings according to the type of technology in question is not. The Renewables Obligation scheme is an example of this, where different technologies receive different levels of support, although there are no limits to the number of renewable generators who might benefit from it. The rationale for different Renewable Obligation Certificate (ROC) bands, is to recognise the different cost profiles of different technologies and the differing amounts of subsidy required to make a given technology viable. The aim of this is to promote such technologies, helping to drive down cost curves over time, as a result of learning. The risks associated with this, is that it is possible to end up trying to pick winners, in which it is possible to lose sight of the overriding objective of hitting the target. Given the size of the Northern Ireland market, it is unlikely that the implementation of this approach would have much direct impact on technology cost curves, although there may be some scope to support particular technologies in certain situations; for instance, where it was particularly suited to a given opportunity.

Allocation and pricing

In addition to differentiating between technologies on the basis of price – that is the amount of subsidy awarded to a given technology, it is also possible to allocate different amounts to different technology groups; that is, to split up the available pool according to given priorities.

4.2.3. Beneficiaries

The second primary parameter is who beneficiaries might be and whether any sub-sets within qualifying beneficiaries should prioritised over others, through either the allocation or level of subsidy provided. At the highest level, this might distinguish between households, commerce and industry. A further consideration may take place within sub-groups of these groups. There is also a question, of whether any intermediaries might also benefit from the subsidies, as well as the ultimate users of the technology.

Households, commerce and industry

The three main groups are households, commercial businesses and industry. There are also potential sub-groups in terms of community groups, or cooperatives. There are significant differences between these sectors, which include:

- **Number of potential recipients** – whereas the industrial sector will have relatively few potential beneficiaries, the household sector will have many.
- **Scale and nature of applicable technologies** – the nature of industrial opportunities will be significantly different to household and commercial technological applications, potentially with greater economies of scale; that is, a declining subsidy requirement for every kWh of renewable heat generated.
- **Nature of linkages with other policies** – in the case of households, income / equity issues; and potential employment / investment issues in the industrial sector.

Such differences between the sectors will have implications as to how the support regime might be constructed.

Intermediaries

Intermediaries, such as energy service companies (Escos), would be entities that sort to act for, particularly households or even small commercial businesses. The rationale for allowing intermediaries such as energy service companies to benefit, is that they may be required to promote wider take-up. An issue associated with this is whether they would require an ongoing operating subsidy. This might be limited to support for installation.

Allocation and levels of support

Again, there are issues of how to allocate and at what level of subsidy. It is interesting to note the issue in the UK of businesses developing solar farms, receiving subsidies that were designed for households, but which were not *dedicated* to them, with larger scale business access to them being *excluded*, in terms of the support regime's design.

As regards pricing issues, there is the question of whether poorer households should benefit more, in order to increase their incentive to take up renewables technologies. Part of the rationale for this would be the greater financing and cash flow challenges that poorer households face, relative to wealthier ones, helping to avoid the subsidy effectively becoming a middle class one.

4.2.4. Approaches to subsidy award

At a high level, subsidy can be awarded in three main ways, assuming that there is a limited pool available. The first of these is to do so, on a **first-come, first-served** basis. The second is to award the subsidy **competitively**; and the third is to do so, on a **negotiated** basis. Again, there are allocation issues and questions of whether the level of subsidy should be variable or fixed.

First-come, first-served

In a first come first served approach, potential beneficiaries would apply for subsidy. This would be awarded until the amount available was exhausted. Potentially, this subsidy could be allocated into different pots or pools for different types of beneficiary to recognise differences between groups.

The amount or level awarded *per project or application* might be fixed at a single level or else at different levels; for instance, in order to compensate for the different costs of technologies or possibly even, for different, say, household income levels. In order to do this, it would be necessary to calculate what the scale of the gap was that the subsidy was being used address it.

Alternatively, the amount of subsidy could be allowed to be variable up to certain cap, but this would be unlikely to be a sensible approach unless there was a non-cost way of differentiating between project applications.

Box 4.1 illustrates a number of metrics in terms of how this approach might be applied in practice:

Box 4.1: Examples of per unit subsidies

> *Administrated £ per unit subsidy:*
>
> *Using a renewable heat supply curve (or similar), pick the subsidy level required to reach the renewable target. All technologies would receive the same subsidy per unit of renewable heat.*
>
> ***Levelised cost and investment return:***
>
> *Tariffs calculated to give each technology an equivalent cost per unit, plus an investment return. This can be tailored to incentivise the take up of specific technologies that are not currently efficient, and to the risk involved in the development of the supporting supply chain.*
>
> ***Levelised cost and investment return below threshold:***
>
> *Same as levelised cost and investment return so long as the per unit subsidy is below a cap. More costly technologies could either be subsidised, but not to a level where they are economic, or excluded from the programme altogether.*

Competitive award

Optimising the allocation of funds will determine both the efficiency and effectiveness of the inventive. Minimising the deadweight cost[35] will be important in Northern Ireland as RHI funds are tightly defined and although the policies can be more closely tailored to local requirements, opportunities for introducing renewable heat are less well diversified than in the rest of the UK. As a result, a more diversified range of strategies may be required than in DECC's incentive package.

An alternative approach might therefore be to award the support competitively, based on a ranking or rankings. Again, there could be one pool or else pools split between types of beneficiary, reflecting their different characteristics. Competitions would take place regularly over the period in which the subsidy was being made available. This approach is often referred to as the "Challenge Fund" approach.

The rationale for awarding subsidy competitively is to obtain best value for money, in situations where it is not clear how much subsidy might be required to achieve a given aim. A problem with fixing subsidy levels in order to address a technology viability gap is that even where there is a banding it is not possible to be completely certain that the award will be sufficient to lead to the desired level of investment. This reflects the differing situations of given applicants within a group and what might be required.

For instance, a set level of subsidy may not have the same impact, say amongst households with differing levels of income. Poorer households may not be able to invest because they cannot raise the upfront capital. For instance, the modelling which has been used by DECC to calculate a required rate of return for a household to invest, tends to work on the basis of levelized costs and revenues. This does not take into account the cost and liquidity issues

[35] Deadweight cost refers to subsidy awarded above the level required to achieve the desired outcome.

surrounding projects actual up-front costs and delayed benefits. The costs are likely to include borrowing costs to finance the investment with the liquidity constraints involving the ability to borrow. However, a variable level of subsidy, albeit with a maximum cap, might help address this constraint.

Ranking could be based on a single evaluation metric – specifically subsidy cost – or a range of other non-cost considerations; for instance, how the award may contribute to a range of policy objectives. Ideally, however, the ranking metric could be set to underpin the objectives of the scheme – for instance, least cost of subsidy per kWh of heat generated, subject to a maximum subsidy cost per kWh. If desired, in order to ensure a greater distribution of support, the amount awarded to any one project in any one competition might be capped. In such an approach, applications for subsidy would be ranked on this basis (as long as an application did not breach the maximum per kWh cap) until all the available subsidy funds were allocated.

There are variations on this approach in which her there can also be different "pools" or divisions where the desired objective is different or where the playing field is uneven because of very different cost structures. The most likely way to structure such pools would be around *either* sector - households, commercial and industrial applications – *or* technology – potentially based around cost or other differences.

Box 4.2 provides some illustrations of how different applications could be ranked in a competitive "Challenge Fund" approaches.

Box 4.2: *Competitively allocated subsidies – the "Challenge Fund" approach*

Lowest subsidy per unit:

A fixed pot of subsidy could be allocated based from the lowest bids per unit of renewable heat upwards until the pot is exhausted. The subsidy is set for each project at its per unit bid.

Highest accepted subsidy per unit

Same as above, but bidders receive the same per unit subsidy, set at the highest accepted bid for the funds

Lowest bid investment return

After setting a base subsidy per technology to make them equivalent, subsidies allocated based on the lowest required investment return. Investment return components of the subsidy set at own bid.

Highest accepted subsidy per unit

Same as above, but bidders receive the same percentage investment return, set at the highest accepted bid for the funds

Where many uncertainties on uptake of subsidy exist, such approaches can help establish what the required level of subsidy might be better. They might be used, for instance, where fixed rate return approaches do not work.

Negotiated

A more interventionist focus on the more challenging, yet fruitful heating projects may provide a hedge against unproven broader-based incentives. Some large projects may benefit from government coordination, negotiation and tailored subsidy. A major project pipeline could be followed and project development assisted. This approach may be suited to large industrial and community scale projects

An alternative means of subsidy award is therefore to negotiate the amount, using calculations of likely subsidy requirements as a starting point. This approach would only be appropriate to more bespoke, larger industrial opportunities, although it might have to be applied to smaller opportunities in the event that either of the first two approaches to award were not successful in generating the required degree of uptake.

Table 4.1 summaries the main choices for support regime design which arise as a result of combining and applying these three high level parameters.

Table 4.1: Primary parameters

High level parameter	**Technologies**	**Beneficiaries**	**Approaches to Award**
Eligibility	Different technologies	Households Commerce Industry Intermediaries	First come-first served Competitive Negotiated
Allocation rule	Neutrally or differentially by technology	Neutrally or differentially by beneficiary group or intermediary	Neutrally or differentially by approach to award
Determination of level of subsidy	Fixed versus variable amounts by technology	Fixed versus variable amounts by beneficiary	Fixed versus variable by approach

Implications for option design

We discuss the choices to be made on subsidy structure, and on wider policy choices, below. Either one or a mix of the above approaches could be used across a number of pots divided by investor type (e.g. household, industrial/ commercial, industrial process heat or community-level projects), technology, or allocation technique. These segments can then be prioritised in terms of where there is the most cost efficient reduction or other considerations. This could involve for example allowing all claims from households up to a certain level, with the balance of the budget being allowed for other types of users. Setting a cascade of budget priorities, where if there is insufficient take-up in one category, remaining funds are allocated to the next group, would support a diversity of policy tools and maximise the use of available funds should there be low take-up in any particular area.

4.2.5. Secondary design parameters

The more general considerations include the specific of the payment mechanism and the monitoring and verification regime.

Payment profile and mechanism

What is the payment profile?

This involves whether the subsidy to be paid upfront or whether it is to be spread over the life of the project. Capital grants are a form of subsidy paid up-front in order to cover the capital costs of a project, whereas a feed in tariff (FIT) is paid in instalments over the life of the project. From a government perspective, a further consideration is who provides the subsidy and whether it will be available in future years as this can constrain the choice of approach. For example, the FITs envisaged for electricity generation will be paid by today's and tomorrow's electricity customers. However, as will be discussed, the RHI is based on a UK Treasury grant allocation, which may not continue beyond a particular point in time, a FIT approach does raise issues regarding certainty of future funding for it – which creates investor risk.

Are subsidy payments to be linked to outputs?

This typically means that a payment is performance-based; that is, it is withheld until particular outputs have been verified in order to ensure that payments are only made once the underlying objectives have been achieved. With a capital grant, this might withholding payment until the project has been completed. In the case of FITs, payments can be tied to particular outputs; for instance, energy / heat generated. Both instances involve the requirement to "pre-fund" the subsidy, thus producing a financing requirement that needs to be borne by the beneficiary or other third party. This can create issues depending upon who the beneficiary is. Poorer households, in particular, might not be in a position to borrow the money to prefund, irrespective of the return available to them.

Can the subsidy be redeemable in certain situations?

Grants can also be made redeemable in certain situations. Where they are being provided *ex-ante* due to an envisaged lack of project profitability and / or affordability, but the context subsequently changes such that these issues are addressed over the life of the project, a portion of the initial grant might be repaid. In case of renewables, projects are to some degree not viable due to the fact that the cost of carbon emissions is not taken into account due to market failure. However, the implementation of a carbon tax or levy would reduce this anomaly. In the absence of a claw-back mechanism, there would be an over provision of subsidy, relative to what might be required, creating wind-fall gains to the owners of the subsidized assets.

A portion or all of a redeemable grant is repaid when particular metrics are met, which trigger this repayment. However, an element of the grant might remain in all circumstances to provide an investment incentive. Such an approach is most applicable for larger subsidy payments.

Are early adopters eligible?

While the GB RHI will not go live until April 2011, all installations completed since 15th July 2009 will be treated as if they were installed on the first day of the scheme going live. This has the advantage of encouraging those at the margin to install renewable capacity on the basis that there will be an incentive, rather than waiting until all details are finalised, at which point their window of opportunity may have passed. We note that DETI may wish to commit to support early adopters by incentivising schemes installed from a date when the shape of the incentive has been confirmed, but details remain to be finalised.

Means of verification

In order to ensure that renewable heat is actually being produced, some form of verification is needed. The degree of oversight must be driven by the cost associated with verification, the materiality of the heat being produced and the incentive on the owner of the renewable heat equipment not to use it. The latter is generally related to the level of ongoing cost; in other words, an appliance that has significant running costs such as fuel is less likely to be used than one that has only minimal maintenance costs associated with it. Verification at a small number of sites is also generally easier.

Possible methods of verification include a periodic audit or site visit, some form of metering, or even a "deeming" approach as in the GB RHI, where equipment with negligible running costs is assumed to produce heat at some reasonable average rate without the need for further verification.

Delivery agent

An RHI could be administered by a number of bodies; the precise choice will depend on those expected to receive the subsidy and the extent to which the RHI is similar to or co-ordinated with another policy (either the GB RHI or another NI policy such as household energy efficiency).

4.3. Further issues to consider when developing options

4.3.1. Fairness

This could turn out to be solely a subsidy to wealthier households, paid for by everyone, unless a way can be found to ensure more equal access to the available subsidies that takes into account the disadvantages that poorer households are likely to confront. This might be politically unattractive.

4.3.2. Profile of Treasury funding

The specific funding profile for the RHI only covers the first four of the ten years between now and 2020. It is back-loaded within those years, but still gives rise to questions about how support will be provided beyond 2014/15. International experience suggests that support based on a limited, short-term funding capital grant or incentive pot can have limited impact in promoting a long-term market and in isolation, a short-term grant or incentive scheme can result in "boom and bust" activity in the market. Furthermore, grants or subsidies can provide little incentive to select the most efficient technology or ensure optimum installation and ongoing operation if the grants or incentive payments are awarded for the installation of renewable technologies, rather than the generation of renewable energy (which is the ultimate aim of the support mechanism).

The funding profile also makes options which lead to a relatively quick delivery of support more attractive; this would push administratively managed options over those that use auctions or tenders, and tend to favour capital grants over a payment profile that covers the lifetime of a renewable heating installation. It makes it difficult to ensure an on-going performance based payment to renewable heat installations.

We have assumed for the purposes of this report that there is no consumer levy or other funding source to add to the £25m from HM Treasury.

4.3.3. Interactions with other renewables policies

As discussed in Section 2, Northern Ireland has ambitious targets for renewable electricity as well as renewable heating. There are at least two issues to consider, therefore: the degree to which scarce resources such as biomass should be prioritised for one use over another, and the implications of the decarbonisation of electricity for the emissions associated with electric heating such as air-source heat pumps.

The first issue has been discussed in previous work for DETI. The second issue will be taken into account in our detailed analysis of options, discussed in the next section. We have assumed that renewable electricity targets are delivered in line with the Strategic Energy Framework, and that the renewable electricity target for 2020 is met.

4.3.4. The gas grid

Section 2 above also set out our understanding of the gas network in Northern Ireland today. The future of the network is important for our purposes, since in assessing the support required for renewable heat technologies, it is important to understand what these technologies would be competing against (what is the 'counterfactual'). The extent to which this counterfactual is gas, rather than say oil, is likely to have a major impact.

We understand that there have been studies of the costs and benefits of extending the gas grid in Northern Ireland, both in the west and in the area currently covered by Firmus Energy. There is also a desire, expressed in the Strategic Energy Framework, to extend the grid. However, there are no firm, specific, plans for doing so and it appears that, for some possible extensions, there would need to be public subsidy.

For the purposes of this report, we have taken the view that only firm, funded policies should be considered when drawing up the counterfactual, and have therefore assumed that the gas grid will not be extended any further than it is at present.

4.3.5. Other

Technology and other constraints (such as administrative, social or behavioural), our understanding of which is still developing, will need to be layered on top of this.

4.4. Option development

To help make the slightly theoretical discussion in the previous section more concrete, we sketch out below some indicative options or strawmen, chosen from the range of possibilities open to DETI. These options are not mutually exclusive, and it may well be appropriate to use different policies for, say, the industrial sector than for domestic consumers (on the other hand, simplicity is desirable). For ease of reference, we have given each option a short descriptive name.

All options set out below have their pros and cons. They should not be read as recommendations, but at this stage are intended to illustrate the range of possibilities, to highlight key points for designing the final policy recommendation(s), and to provoke discussion. We do, however, provide an initial assessment against a set of potential assessment criteria.

4.4.1. "Bang for buck"

In this option, DETI attempts to deliver the maximum possible renewable heat for the given budget. It runs competitive tenders for the delivery of renewable heat, with the winning bidders being those that contract to deliver at the minimum cost per unit of heat. Separate tenders for industry, commercial/ public sector premises and domestic consumers are likely, with the latter tender being open to energy service companies (ESCOs). Payment is conditional on success, and only paid when renewable heat is produced. Implementation lessons from the UK Non-Fossil Fuels Obligation (NFFO) and the recent Californian proposal to run an auction for renewable electricity[36] are incorporated.

Monitoring is likely to be an issue, particularly for the domestic sector. The time needed to set up and run the tendering process may not match with the profile of Treasury funding. The relative complexity of tenders puts off some potential bidders, particularly in the domestic sector, and could be administratively burdensome. The riskiness of the subsidy payments and the cash-flow profile (since subsidy is only paid for results, not for installation) also deters or rules out some bidders, such as those with limited capital.

4.4.2. "Focus on industry"

In this option, DETI decides to fully explore the possibilities for renewable heat in the large industrial sector. Subject to how cost-effective those possibilities turn out to be, DETI would then focus most or all of the incentive on that sector. The profile of subsidy would most likely be tailored to the cost profile of the particular industrial renewable heat projects chosen, within the limits imposed by the Treasury funding profile. This would be likely to include an upfront payment to cover capital costs, and an on-going series of payments for production of renewable heat (although under current funding arrangements these could not be guaranteed to extend beyond 2014/15). Given the small number of projects, monitoring would be relatively inexpensive and could be accurate and reliable. There could be a form of risk-sharing or claw-back whereby industry would repay some of the subsidy if oil or gas prices were higher than expected.

[36] The "Renewable Auction Mechanism" (RAM). Details at: http://www.cpuc.ca.gov/PUC/energy/Renewables/hot/Renewable+Auction+Mechanism.htm

That said, the option would be unlikely to drive significant long-term renewable heat take-up, as the industrial sector accounts for 22%[37] of Northern Ireland's heat demand, so nearly half would need to be converted to renewable heat to achieve the target. It would also not have any impact on fuel poverty or the domestic sector generally. The impact on green jobs might be less than with a wider shift to renewable heat. Because it would rely on a relatively small number of industrial sites, it would be vulnerable to technical problems at those sites (and indeed to them closing down).

4.4.3. "Renewable refurbishment"

Our analysis suggests that a significant proportion of Northern Ireland's housing stock will be refurbished over the next few years. DETI restructures the refurbishment plan to include the presumption that all new heating is renewable, and uses the RHI funding to finance this. This would be an administered solution, so relatively simple, and would overcome one of the major barriers to renewable heat (that homes and businesses dislike the disruption of new installations) since the installation would be happening anyway. An overall plan for the most appropriate technology for each region in Northern Ireland could be produced. The profile of the funding could be matched with the capital expenditure involved in the refurbishments. It would fit with the practice of previous programmes like the Low Carbon Buildings Programme, and the lessons from the appraisal of Reconnect, that a "whole house" approach should be taken to energy use, where reducing demand for energy through energy efficiency is implemented alongside making energy supply renewable. It would be consistent with the "Green Deal" proposed by the UK Government[38].

Monitoring, as for all options with a focus on the domestic sector, is likely to be a problem, although this may be lessened depending on how much, say housing associations, could be relied on to monitor use, or at least to ensure that renewable heating equipment is not subsequently replaced with conventional equipment. A "deeming" approach, as in the GB RHI, could then be used, although this would need to be compatible with the requirements of the Renewable Energy Directive.

4.4.4. "Long term foundation"

DETI decides that its objective is to deliver a broad shift to renewable heat in NI, and to do this it needs to build capability. It therefore offers differential support by technology (profiled to meet the cashflows of those who install renewable heat), with the aim of building installation capability, and the wider supply chain, for Northern Ireland for a range of suitable renewable heat technologies. Green job benefits can be expected to be relatively high. A great deal of practical experience would be gained which would set Northern Ireland up to deliver a high level of renewable heat beyond 2020. This could build on the existing base of installers that was driven in part by the Reconnect programme.

Costs for this option are likely to be relatively high, since technologies that are further from market will need more subsidy per unit of renewable heat than the currently most economic

[37] Source: AECOM report, page 4
[38] http://www.decc.gov.uk/assets/decc/legislation/energybill/1010-green-deal-summary-proposals.pdf

technology. Technologies without a track record in Northern Ireland are more risky than better established technologies and so cannot be relied on to deliver as much. Providing different support by technology in this sort of "banded" approach can be complex, once there are more than a couple of subsidy bands. It requires DETI to take a view on the technologies it thinks are most suitable for Northern Ireland. In any case, because of Northern Ireland's relatively small size, technology support is likely to only drive supply chain improvements rather than technological ones.

4.4.5. "Green oil"

In this option, DETI targets the large proportion of heating in NI that is from oil. Subsidy is provided for owners of oil-fired boilers to convert them so that they can use bio-diesel. DETI runs a tender for companies to provide this conversion for free in buildings not on the gas grid (companies bid on the payment they require per conversion). DETI then provides subsidy for the use of bio-diesel; this could either be to householders or to suppliers (suppliers may already be subject to reporting requirements, which could be an advantage). Significant employment could be created, although this may be at the expense of those trained in technologies[39] that are no longer subsidised.

Bio-fuels are not always sustainably sourced; any subsidy would have to be targeted to ensure it did not encourage unsustainable production. As Annex C suggests, there are tight constraints on the availability of bio-fuel in Northern Ireland. Previous work (AECOM/ Pöyry) has strongly argued that bio-fuel use should focus on transport. Monitoring of bio-diesel use by consumers is likely to be very difficult, particularly if the boilers are dual-fuel. This policy will not drive other renewable heat technologies. It would almost certainly significantly change (worsen) the case for connecting some areas to the gas grid.

4.4.6. "Feed-in tariffs for heat"

Using the financial model, DETI calculates the subsidy level that each renewable heat technology is expected to need, and then implements feed-in tariffs for some or all of the available technologies. These would be available to all customers, domestic, commercial, public sector or industrial. The simplicity would likely be attractive, and it would be consistent with the direction of UK policy on renewables.

To drive installations, feed-in tariffs need to be in place for a period that is roughly the same as the life of the technology; this does not fit well with the fact that funding is only committed to 2014/15. Feed-in tariffs may not be appropriate for technologies at domestic level that require high degrees of monitoring or fuel (DECC opted not to cover wood-fired stoves under the RHI for this reason). There would be no guarantee that the calculated subsidy levels were correct (although consultation should help) or that the 10% target would be achieved.

4.4.7. "NI RHI"

The previous study for DETI by AECOM/ Pöyry looked at the option of an RHI with the same subsidy profile as the GB RHI, but with different subsidy *levels* for specific technologies, to

[39] Such as those in the Renewable Energy Installers Academy

reflect NI's specific circumstances. This has the advantage of being familiar to the larger pool of renewables installers in GB, and relatively simple for the organisation administering the GB RHI to administer as well (some complexity would be added by the different subsidy levels).

The study found that this approach cost "*almost four times ...the efficient net resource cost*". It suggested that this could be improved by having the same support for all technologies, although this would move away from the GB RHI approach quite significantly. The GB RHI proposes a series of payments over several years, which may not fit well with DETI's available funding from HM Treasury.

4.4.8. "Mix and match"

DETI could combine a number of these options, to deliver better value or because it wanted to cover a range of sectors and/ or technologies which required different types of support.

For example, it could follow a basic "bang for buck" model, but at the same time estimate the cost of delivering renewable heat through a "renewable refurbishment" model, and use this as a maximum price for the tenders. It could also opt for administrative options (such as "green oil" or "renewable refurbishment") to deliver an appropriate proportion of the target, and run tenders for the rest, or for any subsidy not taken up by the administrative options after say two to three years.

4.5. Assessment criteria

We have considered a number of criteria that might be used to assess the different options above. These are:

- Fit with other DETI policies and objectives, as well as those of other Departments including the Dept of the Environment, Department for Agriculture and Rural Development and the Office of the First Minister and Deputy First Minister (OFMDFM) where appropriate
- Level of renewable heat likely to be delivered for a given cost.
- Support for renewable supply chain in Northern Ireland.
- Fit with profile of available funding.
- Simplicity for those receiving the incentives.
- Similarity to GB RHI.
- Administrative complexity.
- Ease of monitoring.
- Importance of technological neutrality vs. risk of lock-in to obsolete technology.

We expect to discuss and where appropriate expand on these criteria in the 22nd February meeting.

4.6. Initial assessment

A summary is shown in Table 4.2 below, with "+" meaning that the option scores well against the criterion, and "-" meaning that it scores poorly.

Table [xx]: Assessment of example options against criteria

Option	Policy Fit	Level of RH	Supply chain	Funding profile	Simplicity	Similarity to GB RHI	Admin complexity	Monitoring	Technology neutral
Bang for buck	0	+	0	0	+	-	0	?	+
Focus on industry	-	+	-	+	+	-	+	+	-
Renewable refurbishment	+	?	+	+	+	0	-	Depends on technology	0
Long term foundation	0	-	+	-	-	-	-	-	-
Green oil	+	?	0/+	0	?	-	+	Depends on ability to monitor through suppliers	-
Feed-in tariff	0	-	0	-	0	0	0	-	Depends on banding
NI version of GB RHI	+	-	0	-	0	+	0	-	Depends on banding

4.7. Emerging conclusions

- There are many choices, but most are clearly not suitable based on the criteria set out above.
- There is a trade-off between short-term achievement of targets and longer-term support of renewable heat (and green jobs, which are likely to be related to how long-term the support is).
- The four-year funding horizon is problematic. At a minimum, it favours options that involve upfront spending (e.g. capital grants) or that can be implemented relatively quickly (e.g. administrative options).
- Cash flow considerations (particularly for domestic and small business customers) also push towards a front-loaded subsidy profile, since renewable technologies tend to be high capex and low running cost
- It is difficult to see how a feed-in tariff or rate of return approach can be guaranteed for a sufficiently long period, given the funding from HMT
- Concerns about monitoring, particularly in the domestic sector, are significant. They might be surmountable through housing associations or ESCOs.

5. NEXT STEPS

The next steps are based around taking forward the different steps set out in the NIGEAE guidelines. This will involve adding to and developing the sections contained in this report. The major focus of the work will, however, be based on developing and assessing a series of preferred options. In the sub-sections below, we outline some of the issues to be addressed as part of this, although this list is not exhaustive and is provided for discussion purposes only.

5.1. Detailed analysis including costs and benefits

5.1.1. Final assessment criteria

The first criterion is the amount of renewable heat that the policy looks likely to achieve within the financial envelope set by the Treasury (which is another way of saying the overall cost per unit of renewable heat).

This and the other criteria are set out in Table 5.1 below. Most but not all will be assessed quantitatively, at least to some extent.

Table 5.1: Criteria for assessing policy options

Criterion	Quantitative?	Notes
Amount of renewable heat generated	Yes	
Fuel bill impacts	Yes	Since funding is provided by HM Treasury, this is unlikely to be an issue for most policy options, but included for completeness
Fuel poverty	Yes	Options targeted at the fuel poor may have a positive impact. Those that require significant upfront capital, or loans, may not.
Certainty of delivery of target	No	Assessed through a combination of sensitivity analysis and more qualitative discussion
Oil imports required	Yes	
Carbon emissions	Yes	This will be assessed using the DECC methodology
Employment, particularly in green sectors	Yes, although judgment required	
Displacement effects in other sectors	No	
Administrative complexity	No	

5.2. Outline of the model used for analysis

To be developed.

5.3. Monetary assessment of the shortlisted options

To be developed, but will assess affordability versus the funding available and will include adjustments for optimism bias.

5.4. Non monetary costs and benefits

This will consider other issues raised in Table 5.1.

5.5. Impact on consumers and the fuel poor

This will asses bill impacts in terms of £/ yr, if any. It will also consider any changes to the number of the fuel poor.

5.6. Risks

Some of the risk to be considered include consumer apathy; risks associated with any focus on a small number of large industrial sites one or two of which may not exist in 2020. We will also consider risks arising from technologies deemed eligible and from monitoring arrangements.

5.7. Summary

The analyses will summarise costs and benefits for each option on a net present value basis. As appropriate, the results of different scenario and sensitivity analyses will also be provided, particularly to high-light areas of material uncertainty.

A recommendation will be provided on the basis of these analyses. This will include how much weight do we give to objectives other than hitting the 10% renewable heat target. In part, this is likely to reflect policy preferences arising from feed-back and discussions with DETI.

ANNEX A: THE FINANCIAL MODEL

In development.

ANNEX B: RENEWABLE HEAT TECHNOLOGIES

For each technology, we will include the following information:

Technology overview

Brief description of technology including fuel sources

Suitability of the technology for the demand sector

E.g. space constraints, grades of heat the technology can deliver, environmental issues

Table B1: Technology and demand sector suitability matrix

Sector	Space	Grade of heat			Environmental
		Hot water	Space	Process	
Domestic urban				N/A	
Domestic rural				N/A	
Small commercial/ public					
Large commercial/ public					
Small industrial					
Large industrial					

0 = not suitable 3 = very suitable

Other barriers

These are listed in a table with mitigation measures. This will be qualitative.

Table B2: Technology barriers

Barrier	Overview	Options for Remediation

Interactions with other Northern Ireland and UK policies:

- Fuel Poverty
- Grid decarbonisation
- Social Inclusion
- Air Quality
- Improvement of housing stock quality

- Job creation (this will be supplemented by more detailed economic analysis later in the study).

ANNEX C: USE OF BIOLIQUIDS

Bio-liquids are an option proposed for inclusion in the Renewable Heat Incentive (RHI) being designed for Northern Ireland (NI). This annex considers the arguments for and against inclusion of bio-liquids in the NI RHI

Bioliquids considered

Bioliquids are liquid fuels produced from biomass sources that are suitable for use in power and heating applications. In the case of the NI RHI two bio-liquids have been proposed for heating purposes. These are:

- A biodiesel/ kerosene blend, containing 30% biodiesel. This would be suitable for use in all applications where heating oil is currently used. This would include domestic, commercial and industrial applications. Minor adjustments to the burner systems would be required, but existing storage and transport infrastructure could be utilised.
- 100% bio-oil. This would only be suitable for industrial applications as it would require dedicated transport and storage and the combustion system would need extensive modification.

Feedstocks

Waste oils and fats would be the feedstock for the 100% bio-oil. These could be resourced locally, or imported.

A range of feedstocks are used in the production of biodiesel. The most common are waste oils and fats, palm oil, soya oil, rape seed oil sunflower oil. Oil seed rape could be grown locally. The other vegetable oils are traded commodities that are used for food and energy applications. In particular there is a growing market for vegetables oils for production of biodiesel for the transport market. Ongoing research for DECC (AEA 2010) suggests that biodiesel is considered an important contributor to meeting the Renewable Energy Directive (RED) targets for EU Member States to source 10% of their road transport fuels from renewable sources by 2020. Moreover the modelling work concludes that there will be a shortage of sustainable biodiesel available globally to meet the RED renewable transport fuel targets.

Northern Ireland resource

6,000ha of OSR was grown in NI and Wales in 2010 (Defra 2010). In 2008 AEA carried out a study for DETI (AEA 2008), in which the potential resource of a number of bio-energy feedstocks in 2020 was estimated.

The report estimated that up to 7,000 ha OSR could be grown for energy purposes on surplus arable land in NI in 2020. Assuming current yields of 3.5t/ha about 25,000tonnes of OSR could be produced, which would produce about 9,500t oil or 8,800t biodiesel (9.9 million litres biodiesel). To put this in context, the recent RFA annual report (RFA 2010) reported that 1,568 million litres of biofuels were supplied for road transport use in the UK in 2009/10, with 71% (1,113 million litres)of this being biodiesel.

The report also assumed that the tallow produced in rendering operations would continue to be exported to GB, so that this resource would not be available for bioenergy production. However, it is also possible that some of the tallow could be used at the rendering site as a heating fuel to raise steam for rendering, with the excess being exported. Small scale local processing of tallow/ UCO to produce biodiesel is unlikely as the biodiesel must be shown to achieve stringent standards to be eligible for the RTFC, and we would expect similar standards to be necessary to ensure the quality of biodiesel used in heating fuel.

Costs

Table C1: Costs for domestic use

Fuel	Cost of fuel in pence per litre	Cost of fuel in £ per GJ
Heating oil	40-50ppl	10.7-13.4
Biodiesel (Argus 2010)	60-80ppl (ex tax)	18-24
Wood pellets(AEA 2010)		12-16
Wood chips(AEA 2010)		6-9

Table C2: Cost of installation /maintenance of domestic boilers (AECOM 2010)

Boiler	Capital	Maintenance (£/y)
Oil boiler, new	£3000	180
B30 boiler, conversion	£250	270?
B30 boiler, conversion +new tank	£1500	270?

The conversion of an oil boiler to a B30 boiler is significantly cheaper than installation of a new biomass boiler. However, ongoing costs of maintenance of the converted boiler and the biomass boiler are likely to be similar, and fuel costs will be lower for the biomass boiler using pellets compared to a B30 mix.

The RFA reported a strong correlation between biodiesel prices and fossil diesel prices in 2009/10. Biodiesel was more expensive to produce than fossil diesel, but was typically lower cost than fossil diesel once the 20p/l lower excise duty was applied (Berry, 2010) This price correlation is likely to persist, so that upward pressure on oil prices will be reflected in the price of biodiesel. This means that the use of B30 will not provide any protection from increasing fossil fuel prices.

For industrial use of tallow/ UCO the RFA reported that the market was clearly driven by the biodiesel industry, with increases in price from £250/t to 350/t and even reaching up to £550/t on occasion. Tallow prices were typically £300-£450/t. This means that again, use of tallow/UCO bought on the open market will not provide fuel price stability. However, there is an opportunity for industry producing its own tallow/ UCO to choose to utilise this resource for heating.

OSR prices in 2009/10 were driven by global supply and demand, and there was no clear link between price of OSR and biodiesel. Typical OSR prices (crop prior to oil extraction) are in the range £200/t-£350/t. Currently OSR is one of the most expensive feedstocks used for biodiesel production, prices for heating using biodiesel from OSR would be at the upper end of the range shown.

Sustainability

Both biofuels (liquid or gaseous fuels for transport produced from biomass) and bioliquids are subject to sustainability requirements under the RED. These requirements must be met in order for the biofuels and bio-liquids to count towards:

- measuring compliance with RED regarding National targets;
- measuring compliance with renewable energy obligations; and
- eligibility for financial support for the consumption of biofuels and bioliquids.

In summary the requirements are:

- A minimum Greenhouse Gas (GHG) emissions saving of 35%, rising to a minimum of 50% saving in 2017.
- The feedstocks for the bioliquids shall not be taken from land with high biodiversity value or from land with high carbon stocks.
- There must be a verification process to show the sustainability requirements have been met.

Bioliquids made from wastes and residues are exempt from the requirements on land use, and are assumed to have zero GHG emissions up to the point of collection.

The current debate on sustainability is centred on undesirable land use change, and competition for land between food, feed and energy uses. Waste oils and tallows avoid these concerns as they do not require additional land for production. Vegetable oils for biodiesel are at the centre of the debate. In particular land used for vegetable oil production could either cause direct land use change by displacing land of high biodiversity/ carbon stock value, or indirect land use change by displacing a current enterprise that subsequently moves to land of high biodiversity / carbon stock value. The estimates of land available in NI assume that OSR for biodiesel would be grown on surplus arable land, and therefore avoid the issues of direct and indirect land use change. However, the status of grassland is currently unclear and is still to be clarified by the Commission. Use of such land would increase the resource available in NI, but will lead to a land use change penalty and may not be allowable under RED.

Regarding the bioliquids proposed for heating fuel in NI, the use of waste oils and tallow would present no issues for sustainability. Using vegetable oils would require ensuring that the oils met the sustainability requirements. As mentioned earlier, AEA predict a shortage of sustainable biofuels in the EU by 2020, due to the requirements of RED. There will therefore be stiff competition for sustainable biofuels from the transport market. This competition will be stronger for biofuels from wastes and residues, as these count double towards the meeting the national targets for transport biofuels.

A reporting and verification system similar to that being developed for biofuels will be required to demonstrate that the biodiesel used for heating meets the sustainability standards.

GHG emissions savings

The RED provides default values for production of biodiesel from both wastes and vegetable oils. The relevant values are shown below:

Table C3: Default GHG emission savings

Biofuel production pathway	Default GHG emission saving when used for heating
Rape seed biodiesel	33%
Soyabean biodiesel	25%
Palm oil biodiesel	12%
Waste vegetable or animal oil biodiesel	82%

These values do not include land use change emissions.

These figures show that good GHG emissions savings are achieved from use of biodiesel from wastes and residues for heating. However, GHG emissions savings from use of virgin oils is poor, and the default values are below the RED requirements.

This problem is recognised in the transport fuels sector, hence the prediction of a shortage of sustainable biofuels and competition for biofuels from wastes and residues.

The table below shows the percentage GHG emissions savings that would be achieved from a B30 blend assuming that the feedstock met the minimum GHG emissions savings in RED (35%), met the minimum GHG emissions savings from 2017 (50%), and were produced from tallow/UCO with GHG emissions savings of 82% as calculated from the RED defaults.

Table C4: Comparison of savings between biodiesel and B30 blends

GHG emissions savings for biodiesel	GHG emissions saving from B30 blend
35% (similar to current OSR default)	10.5%
50% (RED minimum in 2017, achievable for best practice in production from OSR)	15%
82% (default saving for UCO/tallow)	25%

To give an idea of the relative savings from biodiesel and wood pellet pathways, the table below shows results calculated by AEA on GHG emissions savings from the use of wood pellets to produce heat in domestic boilers (AEA 2008). The results have been adjusted to exclude landfill credit and to use the RED fossil fuel comparator.

Table [xx]: GHG emissions savings in wood boilers

Fuel	Net GHG emissions saving (%)
Wood pellets from SRC	85
Wood pellets from clean wood waste	92
Wood chips from clean waste wood	94

The AEA GHG tool has now been updated to use the same methodology as RED, and it is recommended that emissions are estimated for the wood pellet pathways following the RED methodology to ensure consistency.

Demand for heating oil in NI

OFTEC (OFTEC 2010) estimate that oil is used in approximately 500,000 homes in NI, and the average kerosene consumption is 2008 litres per annum. This gives a domestic oil consumption of approximately 1 billion litres per annum. Assuming 1 litre kerosene provides 10.35kWh this gives an energy demand of 10,391 GWh. This is similar to the current domestic oil demand of 9,241 GWh estimated by AECOM (AECOM 2010) Biodiesel has about 90% of the energy content of kerosene, so to replace say 30% of the heating energy with biodiesel (A B30 blend) would require 303 million litres biodiesel.

234 million litres of biodiesel from wastes and residues was sold into the road transport sector in the UK in 2009/10. (RFA 2010a). This was 21% of the total biodiesel sold.

This implies that if there were a substantial uptake of biodiesel from tallow/ UCO for heating in NI it could require all the biodiesel from tallow/ UCO available to the UK.

Summary

Using 100% biodiesel from waste oils/ tallow in domestic heating boilers potentially has good GHG emissions savings, about 82%. However, if the biodiesel component is limited to 30% for operational reasons then the GHG emissions savings in each installation are reduced to 25%. For comparison, a B30 blend of biodiesel meeting the minimum GHG emissions savings requirements for RED of 35% yields a GHG emissions saving per installation of 10.5%.

The GHG emissions savings may be further reduced if the converted boiler has a lower efficiency than modern oil boilers.

A pellet boiler using clean waste wood as feedstock has a GHG emissions saving of about 92% for each installation.

B30 is not a 'drop in fuel'. The boiler must be adapted to use B30, and cannot then be easily changed back to operation on 100% fossil oil.

There will be stiff competition for biodiesel from the road transport sector. In particular biodiesel from UCO/tallow will be in demand because of its good sustainability characteristics and high GHG emissions savings. There is therefore likely to be a problem with availability of biodiesel from UCO/ tallow at an acceptable price in the heating market.

Recent studies suggest that the retail price for wood pellets is slightly higher than for heating oil, and that the price of biodiesel is substantially higher than both, on a £/GJ basis. The price of biodiesel is tracking the diesel price, and it is not yet clear how the price of wood pellets will relate to the fossil fuel prices.

If bioliquids are included in the RHI, then a scheme to monitor and verify sustainability and GHG emissions savings will be required to comply with RED. The current model in the transport sector places the responsibility for these issues with the fossil fuel supplier.

The issues, advantages and disadvantages of supporting bioliquids do not differ markedly between NI and GB. There does not therefore seem to be a case for deviating from the GB position. The higher proportion of oil fired equipment in NI does however offer the prospect of a rapid take up at minimal initial cost which would support fuel poverty alleviation and social inclusion policies by allowing poorer households to share the benefit and participate. The greenhouse gas savings are critical to value for money, however, and a method of ensuring that only waste derived materials are used is needed to prevent very high costs of abatement and potential negative impact.

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Dept of Environment Planning Policy Statement 18

Department of Agriculture and Rural Development Renewable Energy Action Plan 2010:

1. Exploit investment in the development of emerging technologies which can be supplied by the agricultural sector and/or which are suitable for adoption within the agricultural sector to accelerate the adoption and stimulation of the market.

2. Exploit the opportunities associated with Sustainable Scale Anaerobic Digestion and associated technologies.

3. Exploiting opportunities relating to the production of heat, particularly with the development of the Energy Supply Company (ESCo) model.

4. Exploiting opportunities relating to energy security by displacing fossil fuel derived energy with renewable energy within the agricultural and forestry sectors – with a view to growing the demand and having a positive impact on energy security and carbon footprint.

5. Exploiting opportunities associated with integrated business solutions – enhancing energy security and increasing competitiveness.

6. To ensure timely delivery of the strategy DARD must put in place an effective implementation mechanism based on the appointment of a group of external stakeholders to oversee the delivery of the strategy.