

**UK Renewable Heat Incentive (RHI)**  
**Amendments to the Domestic and Non-Domestic Sectors**  
**NOTIFICATION**

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## Executive summary

The non-domestic Renewable Heat Incentive (RHI) was introduced in November 2011 to provide financial support for renewable heat technologies in the industrial, commercial and public sectors. The first phase of the scheme was originally approved by the European Commission ('the Commission') on 28 September 2011 (case number SA.32125). This original notification only involved aid to non-domestic recipients.

The scheme was extended to the domestic sector in April 2014 to provide financial support for renewable heat technologies to homeowners, private and social landlords and people who build their own homes. The domestic RHI scheme was originally approved by the Commission on 9 December 2013 (case number SA.35766).

This notification concerns proposed amendments to both the domestic and non-domestic RHI as a result of agreement that the RHI budget will continue to rise from £640m in 2015/16 to £1.15bn in 2020/21 and a subsequent consultation on reforms to the RHI. It is important we get the most out of this spending so that we can ensure each pound spent contributes to the Government's vision of secure, affordable and clean energy throughout the UK.

The main changes to the scheme are:

- amendments to non-domestic biomass banding and tiering
- the introduction of deemed payments in the non-domestic scheme for shared ground loop systems
- the introduction of assignment of rights allowing householders to assign their RHI payments to a third party who has financed some or all of the installation to enable those with limited access to finance or savings to access the scheme.

In line with paragraph 250 of Section 5 of the guidelines on state aid for Environmental Protection and Energy 2014-2020 ('the Guidelines'), these notifiable changes require the RHI to be adapted to the Guidelines because the scheme was originally approved under a previous version (the former Guidelines on State aid for Environmental Protection 2008). To facilitate the Commission's assessment we have set out the RHI scheme in its entirety in this revised pre-notification.

### 1. Policy background

- 1.1. The Renewable Energy Directive (2009/28/EC) sets a binding target of 20% of the EU's energy consumption coming from renewable sources by 2020. The UK is legally required to contribute to this target by increasing its share of renewable energy to 15% by 2020. This represents a near seven-fold increase in renewable energy in less than a decade and is the largest percentage point increase of any Member State.

- 1.2. The previous UK Government's Renewable Energy Strategy<sup>1</sup> sets out how this ambitious target would be delivered. Under the lead scenario, renewable sources would provide:
  - 12% of heat (up from 1.5% in 2009)
  - 30% of electricity (up from 5.5% in 2009)
  - 10% of road fuel (up from 2.6% in 2009).
- 1.3. A comprehensive financial incentive framework to achieve this significant increase in renewable energy was part of this strategy. This financial incentive framework includes the Renewables Obligation (RO), Contracts for Difference (CfD) and the Feed-in Tariff schemes (FITs) to provide financial support for the production of renewable electricity generation, and the Renewable Transport Fuel Obligation.
2. The Renewable Heat Incentive
  - 2.1. Renewable heat technologies are currently not able to compete financially with fossil fuel alternatives. If this market failure is not addressed, it would prevent the UK from meeting its legally binding renewable energy target. Contributions from the electricity and transport sector are at the upper bound of what they can deliver and still leave a gap towards the renewable energy target.
  - 2.2. The RHI is the UK Government's flagship policy for reducing emissions from heat and contributing to the UK's legally binding targets.
  - 2.3. The financial support provided by the RHI is in the form of a range of pence/kWh tariffs paid to useful heat generated from renewable technologies, similar to FITs used for renewable electricity both in the UK and other countries.
  - 2.4. The tariffs cover the cost difference between heat generated from renewable technologies and heat generated from fossil fuel sources (and varies by technology and size of the installation).
  - 2.5. The non-domestic RHI was introduced in November 2011 to provide financial support for renewable heat technologies in the industrial, commercial and public sectors. The first phase of the scheme was originally approved by the Commission on 28 September 2011 (case number SA.32125). This original notification only involved aid to non-domestic recipients.
  - 2.6. A number of changes to the non-domestic RHI came into force, covering air quality, metering and other minor changes following approval by the Commission on 24 September 2013 (case number SA.36345).

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<sup>1</sup>The UK Renewable Energy Strategy, July 2009  
([https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/228866/7686.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/228866/7686.pdf)).

- 2.7. The scheme was extended to the domestic sector in April 2014 to provide financial support for renewable heat technologies to homeowners, private and social landlords and people who build their own homes. The domestic RHI scheme was approved by the Commission on 9 December 2013 (case number SA.35766).
- 2.8. Further amendments to the non-domestic scheme were introduced in May 2014 following approval by the Commission on 19 December 2013 (case number SA.37652). These amendments, amongst other things, extended the existing non-domestic RHI by introducing new technologies and tariffs including for air source heat pumps, deep geothermal, solid biomass Combined Heat and Power (CHP) systems and biogas.
3. RHI objectives
  - 3.1. The core objective of the RHI is to increase the level of environmental protection compared to the level that would be achieved in the absence of the aid. Other objectives include:
    - Reducing emissions from heat to contribute to meeting its target under the RED (2009/28/EC) of increasing consumption of renewable energy to 15% of total energy consumption by 2020.
    - Driving a step change in the uptake of renewable heat generation by providing targeted financial support to a wide range of renewable heat technologies.
    - Developing the low carbon heat market and supply chain so that it is in a position to support the mass roll out of heating technology required in the 2020s and beyond.
4. RHI reform
  - 4.1. In November 2015, the UK Government confirmed its continuing commitment to support the transition to low-carbon heating in the UK, when it announced its intention for spending on the RHI schemes to rise from £430 million in 2015/16 to £1.15 billion in 2020/21. This settlement provided clarity on the funding available for renewable low-carbon heat during this Parliament, and greater investor certainty.
  - 4.2. However, it is important that we get the most out of this additional spending. As such, we launched a consultation to reform both RHI schemes, so that we can ensure each pound spent contributes to the Government's vision of secure, affordable and clean energy throughout the UK.
  - 4.3. These reforms aim to ensure the objectives of the scheme (see 3.1) continue to be met in a manner which:
    - Is **affordable**, by ensuring that the costs of the RHI are firmly controlled

- Offers **value for money** for the taxpayer by maximising the benefits of the scheme including carbon abatement and renewable heat
- Promotes deployment of those technologies which are likely to be **strategically important in the longer-term**
- Contributes to the **development of sustainable markets** by driving cost reductions and innovation in technologies to help build markets that are sustainable in the future
- Promotes widespread access by supporting families that are **less able to pay** to access the scheme
- Incorporates a **robust scheme design** that avoids creating or responding to perverse incentives and minimises the risk of overcompensation as far as possible.

4.4. The UK Government consulted on reforms in order to gather further evidence on the likely levels of deployment of each of the technologies in light of the proposals.

### Approach to notification

#### 5. Structure

- 5.1. This notification seeks approval from the Commission to implement a series of amendments to the existing RHI scheme, in both the domestic and non-domestic sectors.
- 5.2. The proposed amendments do not alter the main characteristics of the RHI scheme, as previously approved, and the objectives and overall form of the measure remain the same.
- 5.3. The original RHI scheme (case number SA.32125) and subsequent notified amendments (case numbers SA.36345, SA.35766 and SA.37652) were approved and deemed compatible with the **former** Guidelines on State aid for Environmental Protection (2008). The modifications to the RHI presented herein mean that the full scheme will now be assessed under the **current** Guidelines. This is in accordance with section 5 (paragraph 250) of the Guidelines.
- 5.4. To ensure that the RHI scheme continues to meet the conditions under which State aid for environmental protection and energy may now be considered compatible with the internal market, this pre-notification presents the full (and reformed) RHI scheme. Upon request from the Commission on 05.07.2016, the full scheme is described and assessed against the Guidelines, with proposed amendments highlighted [in blue](#).

## Description of the RHI scheme

### 6. Background and objective

- 6.1. Renewable heat technologies are currently unable to compete financially with fossil fuel alternatives. Without financial support, the private sector is not expected to invest sufficiently to achieve the required uptake levels. If this market failure is not addressed, it will prevent the UK from meeting its legally binding 2020 renewables target as contributions from the electricity and transport sector are already at the upper bound of what they can deliver. We expect that by increasing the uptake of renewable heat technologies, the RHI will enhance competition and drive down the cost of equipment and installation.
- 6.2. The RHI scheme has and will continue to make a significant contribution to the UK's share of the European carbon reduction target and have a positive impact on security of supply by reducing the dependence on fossil fuels.
- 6.3. The scheme has and will continue to increase public engagement on energy use which could see a change in behaviour in terms of renewable energy, energy efficiency and the creation of green jobs.
- 6.4. It will also prepare the UK for mass rollout of renewable heating on a pathway to 2050, by building sustainable renewable heat supply chains, improving the performance of renewable heating technologies, reducing costs of installing renewable heating technologies through deployment at greater scale and reducing non-financial barriers- especially the general public's perceived risk and lack of awareness of renewable heat technologies.
- 6.5. The RHI is established across England, Wales and Scotland. Northern Ireland operates a separate renewable heat incentive scheme.

### 7. National legal basis

- 7.1. The legal basis for the RHI is Section 100 of the Energy Act 2008<sup>2</sup>, which extends to England, Wales and Scotland. This is primary legislation which gave the Secretary of State the power to make regulations providing for a renewable heat incentive scheme.
- 7.2. The RHI Regulations 2011 were made under that power and established the non-domestic RHI scheme. The regulations were amended in 2012, 2013, 2014, 2015 and 2016 and will be further amended to reflect all of the changes set out in this document in 2017.
- 7.3. The domestic RHI Regulations 2014 were also made under that power and

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<sup>2</sup> <http://www.legislation.gov.uk/ukpga/2008/32/section/100>

established the domestic RHI scheme. The regulations were amended in 2015 and 2016 and they will be further amended to reflect all of the changes set out in this document in 2017.

## 8. Scope of the notified changes

8.1. The UK Government proposes the following amendments to the non-domestic RHI as the subject of this pre-notification:

- **Amendments to biomass banding** – removal of biomass banding and introduction of a single biomass tariff for all sizes of system
- **Amendments to biomass tiers** – increasing the tiering threshold applicable to biomass plants from 15% to 35% load factor. After a certain level of generation in any given year, an RHI participant moves from receiving an initial 'Tier 1' tariff, to a second lower 'Tier 2' tariff'. The tier threshold proposed here is equivalent to a heat load factor of 35%. This means a system could run at full capacity for 35% of the hours in a year, before moving to the lower Tier 2 tariff for any further generation in that year.
- **Introducing deeming for shared ground loops** – allowing shared ground loop systems for residential properties in the non-domestic RHI to use deemed (not metered) heat demand. Currently shared ground loop systems have to be metered under the non-domestic RHI, even if they supply solely domestic properties. We are changing scheme rules to allow RHI payments based on deemed heat demand as per the domestic scheme, with a requirement to meter the installation to provide data on how the system is functioning.

8.2. The UK Government also proposes the following amendments to the domestic sector of the RHI as the subject of this pre-notification:

- **Introducing assignment of rights (AoR)** - allowing householders the choice to assign their RHI payments to a third party who has financed some or all of the installation to enable those with limited access to finance or savings to access the scheme.

## 9. Organisation and structure

9.1. The RHI is designed by the UK Department for Business, Energy and Industrial Strategy (BEIS) (previously the Department of Energy and Climate Change (DECC)) and is administered by an administrative arm of the UK Regulator for Energy, the Office of Gas and Electricity Markets (Ofgem). Ofgem manages the scheme and is the granting authority that will determine, in accordance with the criteria in the Regulations, whether a potential individual beneficiary is eligible for RHI support.

9.2. Administration means registration, accreditation, calculating and making payments, monitoring compliance and taking enforcement action. Ofgem is already responsible



for administering the RO scheme and FITs.

## 10. Beneficiaries

10.1. All sectors of the economy will need to play a part in the switch to a low carbon society if the UK Government is to meet its legally binding renewable energy target. The RHI scheme is therefore open to all individuals and organisations in the domestic and non-domestic sector, ranging from households and small businesses to large industrial organisations. RHI payments are made to the owners of eligible renewable heat installations and producers of biomethane injected into the national gas grid.

### Non-domestic beneficiaries

10.2. Under the non-domestic scheme, the UK considers that RHI payments to undertakings, in relation to the outlined changes to support could fall within the scope of Article 107 of the Treaty on the Functioning of the European Union (TFEU). The RHI is funded from the general Government budget and therefore involves State resources. It selects only certain technologies for heat production, as opposed to conventional or other renewable heat production technologies. Through tariffs, it provides renewable heat producers with an advantage that cannot be found under normal market conditions.

### Domestic RHI

10.3. We consider that financial support to householders relating to renewable heat does not raise any questions of state aid because they are not considered to be undertakings. However, the domestic RHI scheme offers payments for renewable heating systems in rented properties. As such, payments would be made to the owner of the renewable heating system, who will normally be the landlord, and potentially give rise to state aid. In other cases the renewable heating systems will be installed in social housing. We are seeking approval of any state aid under the domestic RHI to both private and social landlords as compatible with the Treaty on the Functioning of the European Union (TFEU)<sup>3</sup>.

10.4. In the domestic RHI, we intend the following owners of eligible systems in domestic properties would be eligible for support:

- **Owner-occupiers** - those who owns their own home, whether it is their primary or secondary residence. A second home is one which is not a person's main residence and which is not used primarily for business purposes. Applications made for a second home will be subject to greater restrictions than where the property is the primary residence, such as a

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<sup>3</sup> [http://eur-lex.europa.eu/resource.html?uri=cellar:2bf140bf-a3f8-4ab2-b506-fd71826e6da6.0023.02/DOC\\_2&format=PDF](http://eur-lex.europa.eu/resource.html?uri=cellar:2bf140bf-a3f8-4ab2-b506-fd71826e6da6.0023.02/DOC_2&format=PDF)

metering requirement.

- **Private landlords** - Undertakings who own domestic properties that they rent out. Private landlords who own eligible systems in domestic properties will be eligible for the domestic RHI, on the same tariff basis as owner occupiers.
- **Registered social housing providers (social landlords) and third party ownership** - will be able to apply for the domestic RHI in relation to those eligible systems, and will receive the same tariff as owner-occupiers.
- **Self-builders** - someone (who is not an undertaking) who has built or commissioned a home for his or her use, either by building the home on their own or working with builders, will be able to apply to the RHI and will receive the same tariff as owner-occupiers.

#### *Assignment of rights (AoR)*

- 10.5. The introduction of AoR will allow a third-party financier (a person, organisation or community group that is neither the homeowner nor renewable heat installation owner) to provide financial assistance to domestic beneficiaries for the cost of renewable heat installations. The domestic beneficiary will assign the right to RHI payments to the third-party financier in exchange for providing some or all of the up-front cost of the renewable heat installation, which will still be owned by beneficiary. Registration of third-party financiers will be open to any person, organisation or community group that is neither the homeowner nor renewable heat installation owner. They must be a member of a relevant consumer code, approved by the Chartered Trading Standards Institute (CTSI). Domestic beneficiaries will be free to choose to which registered financier they wish to assign their right RHI payments. The registration process will be managed by the granting authority, Ofgem. AoR will help consumers with lower credit scores and/or less ability to access financing to overcome the financial barriers currently restricting deployment of renewable heat installations, and open up the scheme to those less able to pay.

## 11. Form of the aid

### *Eligible technologies and installations*

- 11.1. The RHI scheme provides support for a wide range of renewable heat technologies and fuel sources that are consistent with the Renewable Energy Directive, these are:
- Domestic RHI:
    - biomass boilers and biomass pellet stoves
    - air source heat pumps
    - ground source heat pumps

- solar thermal.
  - Non-domestic RHI:
    - ground source heat pumps (including shared ground loop systems)
    - air source heat pumps
    - solar thermal
    - deep geothermal
    - combined heat and power (using renewable fuel sources)
    - solid biomass (including municipal solid waste)
    - biogas combustion
    - biomethane injection.
- 11.2. There are a number of renewable heat technologies and fuel sources that are not supported by the scheme, including biogas/biomethane from landfill gas, bioliquids and technologies which deliver renewable heat directly through warm/hot air. For some of these technologies and fuel sources there is insufficient cost data on which to base tariffs. For other technologies and fuel sources there are practical issues, for example, complex heat metering and sustainability reporting for bioliquids, which mean that they cannot be supported at this time.
- 11.3. In the domestic sector, renewable heat installations will only be eligible for the RHI scheme if energy efficiency measures have been put in place (cavity wall and loft insulation) and the renewable heat installation is installed in an existing home (not newly built properties<sup>4</sup>, except self-build homes).
- 11.4. Domestic renewable heat installations, other than solar thermal<sup>5</sup>, are only eligible for the RHI scheme where the renewable heating installation is the primary heat source for meeting the space and water heating requirements of the property<sup>6</sup>. In the non-domestic sector, heating properties through a combination of fossil fuel heat and renewable heat is allowed. However, the RHI tariff only pays for the renewable element of heat used, and this will be verified through metering.
- 11.5. To ensure the integrity of the scheme and ensure consumer confidence in the quality of renewable heat installations, small size installations must meet certain technical standards as set out in the Microgeneration Certification Scheme (MCS) and must be installed by an MCS installer (a similar requirement exists under FITs). The MCS is a certification scheme accredited under the European standard EN 45011 by the United Kingdom Accreditation Service (UKAS), which certifies low carbon and

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<sup>4</sup> Installing heating systems in new build is less expensive than where retrofitting or replacing existing heating systems.

<sup>5</sup> Solar thermal, unlike other renewable heat technologies, can generally not meet the total heat requirement of a property.

<sup>6</sup> This is to avoid households claiming RHI payments, but at the same time running their cheaper fossil fuel heat installation. This is not an issue for the non-domestic sector because the renewable heat output is metered and not estimated as explained in paragraph 2.5.

renewable energy technology products (up to 45kWth) and installers against robust standards<sup>7</sup>. Products and installers certified under an equivalent scheme accredited under EN 45011 are also eligible. For example, the internationally recognised Solar Keymark is an equivalent certification scheme for solar thermal products.

- 11.6. For medium and large scale technologies (>45kWth) the MSC or equivalent standards do not apply. These installations are generally more bespoke and manufactured and installed by technical experts. Therefore the role of the RHI administrator will be limited to checking the general eligibility criteria (technology, proposed use etc.) as part of the registration and accreditation process.

#### *Assignment of rights (AoR)*

- 11.7. Between January and March 2015 DECC (now BEIS) ran a call for evidence on the possibility of opening up the domestic RHI to more finance. AoR helps consumers with lower credit scores and/or less ability to access financing, to overcome the financial barrier currently holding back deployment and make the scheme more accessible to those in fuel poverty. It allows a wider section of the population to participate in the RHI. We expect that AoR will increase deployment by tackling the barrier of high upfront costs of renewable heating installations faced by many potential beneficiaries.
- 11.8. We received 48 responses to the call for evidence, from a variety of organisations including manufacturers, energy companies, charities, consumer protection organisations, social landlords, installers, trade associations and a local council.
- 11.9. A clear majority of the responses indicated that the cost of renewable heat installations was a barrier to effective take up (34 responses agreed, 2 disagreed), that the introduction of third party financing would help overcome that barrier (28 agreed, 2 disagreed) and that there is a demand for third party financing (24 agreed, 6 disagreed). AoR was the more popular model in the call for evidence with 17 responses in favour, 4 for conventional third party ownership financing and 6 in favour of allowing both models in the scheme.
- 11.10. We intend to treat AoR installations as closely as possible to comparable non-AoR installations. We do not intend to exclude or restrict any technologies, have separate tariffs, degression triggers or budget caps specifically for AoR installations.

#### *Shared ground loops*

- 11.11. We intend to allow shared ground loop systems for residential properties in the non-domestic RHI to use deemed (not metered) heat demand. Currently shared ground loop systems have to be metered under the non-domestic RHI, even if they supply

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<sup>7</sup> The MCS product scheme was notified to the European Commission in August 2007 under the European Technical Standards Directive (Notification 2007/0458/UK).

solely domestic properties. We are changing scheme rules to allow RHI payments based on deemed heat demand as per the domestic scheme, with a requirement to meter the installation to provide data on how the system is functioning.

11.12. Shared ground loop system tariff would be the same as the non-domestic RHI scheme, previously approved by the Commission (SA.35766). The tariff would be paid for a deemed heat that estimates the property's expected annual renewable heat usage. The deemed heat will be calculated as the heat use figure (in kWh) set out in the upgraded energy performance certificate completed after the installation of the required energy efficiency measures.

11.13. The UK anticipates that this type of network would be of most interest to social and private landlords. The landlord would be the owner of the system and would receive RHI payments based on the heat demand of the individual properties.

## 12. Payments

12.1. RHI payments are determined by multiplying the relevant tariff with the beneficiary's heat load in kWh/year. The RHI scheme only supports useful heat production, i.e. not deliberately wasting or dumping of heat or creating an artificial heat load purely to claim RHI payments.

12.2. The methodologies used to establish the beneficiary's heat load include deeming (estimating the heat load) and metering (metering of actual heat output and/or usage).

### *Deemed payments – domestic RHI*

12.3. In the domestic sector RHI payments will be based on the deemed heat load of the property. To determine how much heat is generated, we use a deeming calculation that estimates the property's expected annual renewable heat usage. Multiplying the deemed figure by the technology's tariff rate will determine the annual payments. The tariffs are determined using the same principles as those approved by the Commission for the non-domestic scheme (case number SA 32125).

12.4. Tariffs are designed to compensate the additional costs of renewable heat compared to the cost of a conventional fossil fuel boiler as there is no relevant market price for heat since more than 98% of heat is generated on-site by its consumers (see paragraph 49 of Commission decision SA 32125).

12.5. The deeming calculation is the heat use figure in kWh set out in the updated Energy Performance Certificate (EPC) completed after the installation of the required energy efficiency measures. This calculation is based on the Reduced Data Standard Assessment Procedure (RdSAP) methodology, a simple and well established methodology based on a national calculation model and used for numerous BEIS

policies. It has the benefit of independent, trained assessors and robust audit arrangements. If the heating system is a heat pump, the heat use figure will be combined with its expected performance level to estimate how much renewable heat will be generated.

- 12.6. Deeming has the advantages of avoiding any incentive to increase heat generation purely to increase the amount of support (which might exist if heat metering was used) and avoids the high cost and complexity of heat metering, which would have a disproportionate effect in particular at the (small) domestic scale (heat metering is more technically complex and costly than electricity and gas metering). The heat load of a property will be established by an independent accredited assessor, using an established methodology. Payments at domestic level will be subject to a cap per property and per year to ensure that the right balance is struck between managing the costs of RHI scheme and fairness to consumers by providing sufficient support to those who have invested in renewable heat installations.

*Metered payments – domestic RHI*

- 12.7. In the domestic scheme payments will be based on metered usage rather than estimated usage:
- If the renewable heating system is installed alongside another space heating system
  - For second homes – As second homes do not tend to use as much heat as a primary home, applicants for second homes will have to install a meter which will measure the amount of heat used. RHI payments will be based on the meter reading, but only up to the deemed amount applicable to the property, removing the opportunity for fraud and ensuring value for money.
- 12.8. The requirement to base payments on metered usage will not apply to solar thermal systems, as they will always be installed alongside a space heating technology, and the deeming figure will take occupancy into account.

*Metered payments – non-domestic RHI*

- 12.9. The heat load of non-domestic installations is metered. Heat meters are already in use, particularly in situations where the installation is part of an industrial process, and in most cases the meter cost is not disproportionate to the cost of the installation.
- 12.10. The risk of heat dumping or over generating is small in the non-domestic sector because RHI payments will only be one of many factors in deciding whether or not to run a renewable heat installation. In addition, the RHI tariffs (aiming to compensate for both capital expenditure and operational expenditure) are expected to be less

than the marginal operating costs of generating an extra unit of heat output. Where tariffs are expected to be higher than the marginal costs of energy generation we have addressed this potential risk with tiered tariffs<sup>8</sup>.

*Deemed payments – non-domestic RHI*

12.11. The owner of the system would receive RHI payments based on the heat demand of the individual properties. This is in line with the original approval of the scheme, which specifies that payments are to go to the owner of the renewable installation (case number SA.35766, paragraph 7). This is also in line with the current non-domestic approval, which states that RHI tariffs can apply to non-domestic beneficiaries owning renewable boilers and this includes multiple residential dwellings served by one renewable heating installation (e.g. district heating) (case number SA.32125, paragraph 13).

*Consumer price index*

12.12. Tariffs will be adjusted each year based on the Consumer Price Index (CPI) to take inflation into account and will apply to all participants who applied on or after 1 April 2016.

*Metering and monitoring service packages - domestic RHI*

12.13. Some installers offer their customers a Metering and Monitoring Service Package (MMSP) for heat pumps and biomass boilers. In such a case the installer would fit an advanced set of meters to the new heating system so that the householder and installer will be able to view measured data from their system over the internet.

12.14. The MMSP policy measure is part of a range of initiatives to promote better design and installation and encourage installers to take responsibility for their installations as well as enabling BEIS to disseminate results.

12.15. Payments to MMSP participants are intended to compensate for the equipment costs and the on-going costs to collect and publish data. It is not intended to compensate for installation costs which we consider the consumer will still have to incur. We anticipate that the costs for such a package would come to approximately £1,200<sup>9</sup> per package for heat pumps (GSHP and ASHP) and £1,100<sup>10</sup> per package for biomass boilers and we intend to compensate households for the full cost of such a package through a flat-rate payment of £230 per year for up to seven years for heat pumps and £200 per year for up to seven years for biomass (payments will cease if the package is stopped sooner).

<sup>8</sup> After a certain level of generation in any given year, an RHI participant moves from receiving an initial 'Tier 1' tariff, to a second lower 'Tier 2' tariff'.

<sup>9</sup> This amount has been discounted to 2021.

<sup>10</sup> As above

12.16. The UK considers that compensation for the cost of a MMSP is not aid for the following reasons:

- Financial support to householders does not raise any questions of state aid because they are not undertakings.
- MMSP enables the consumer of the installation to adjust their use in order to secure better performance from the heating system. In particular, it enables the person operating the system to gain a better understanding of how their fuel usage affects performance and incentivise efficient operation. In the case of a landlord or third party owner, it will therefore be the occupant of the property (who is not an undertaking) rather than the landlord who obtains this benefit.
- There is no selective advantage for any other undertakings: in particular, in relation to installers and suppliers, we intend that the data produced by the packages will be anonymised and published so that all installers and suppliers will be able to use the data to improve the services and equipment they provide.

### 13. Duration

- 13.1. A uniform duration of 20 years of tariff payments for the non-domestic scheme ensures consistency between the RHI scheme, the RO and FITs to avoid unintended consequences, i.e. investment in a particular installation not because it is the most appropriate renewable energy technology, but because of its tariff lifetime.
- 13.2. On the domestic RHI, payments are made over seven years for each renewable heat installation. The tariff period is designed to strike a balance between a scheme that appeals to consumers, short-term affordability from a Government budgetary perspective, and retaining incentives for consumers to keep using the renewable heating system over its lifetime.
- 13.3. The UK Government is committed to keeping the RHI open to new applicants until at least 2020/21<sup>11</sup>. This will provide certainty to the renewables sector and will give the market confidence to invest and will allow supply chains to develop. Under the current proposals this means that the last RHI payment will be made in 2040/2041.

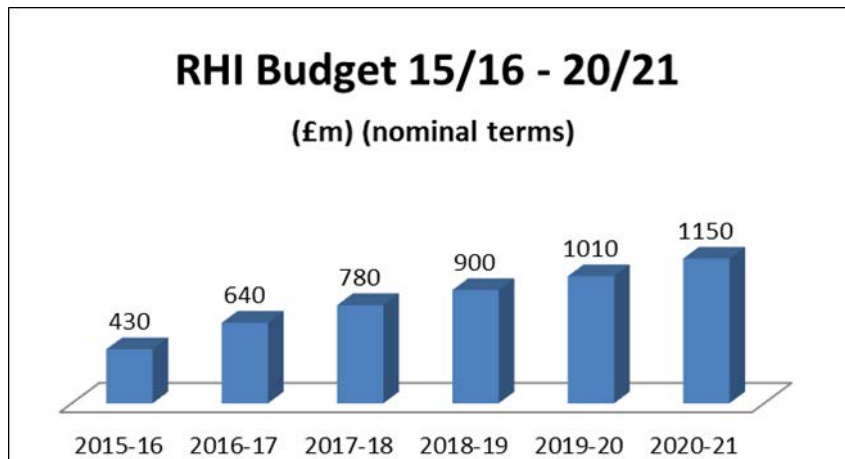
### 14. Financing and budget

- 14.1. The RHI is funded through general taxation, not through a green levy on energy bills.
- 14.2. The budgets for current and future years are as follows. These are annual budgets to meet committed and new expenditure in both schemes for the year in question.

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<sup>11</sup> Unless the scheme cap is triggered (see tariff reviews and budget management).





14.3. Since early estimates of the spending and benefits we have significantly updated our evidence base. We anticipate that by 2020/21 the reformed RHI as a whole could deliver 22.3TWh of renewable heat, with a £1.15bn spending on the total scheme for the year. This could deliver 25-38MtCO<sub>2</sub>e of carbon abatement by 2027. This wide range reflects differing assumptions regarding the extent of upstream emissions abatement (as a result of diverting the food waste from landfill sites) and methane leakage during the anaerobic digestion process. We will gather further evidence as to the appropriate level of carbon savings to report.

14.4. An overview of the costs and benefits of the total RHI scheme, including annual details, is included in Annex C.

#### 15. Tariff reviews and budget management

15.1. As the cost of renewable heat installations fall as the industry matures and economies of scale are achieved, the Government needs to ensure that spending on the RHI is affordable in the current economic climate and remains value for money. As such, the RHI scheme is subject to scheduled reviews and tariff degressions in line with existing renewable electricity support schemes, both in the UK and internationally.

15.2. There are several elements to ensuring that we have appropriate control over spending. These are:

- **Budget management:** how the scheme responds to greater spend than anticipated on either individual technologies, or for the scheme as a whole. This is achieved through caps for spending and degression of tariffs for new applicants.
- **Eligibility and other policy enablers:** the eligibility criteria for the pool of projects which are able to take advantage of RHI. This controls costs by expanding or limiting those who are able to access the scheme.
- **Tariff rates and structure:** the tariff rates offered by the RHI establish the financial attractiveness of the RHI for potential participants.

- 15.3. These elements combined provide some control over the level of spending. However as a demand led scheme the exact level of spending and deployment of different technologies remains uncertain.
- 15.4. We anticipate that these elements will work together in the following way:
- **Tariffs and eligibility:** create demand through offering a rate of return on additional investment, as compared to the counterfactual.
  - **Degression:** designed to reduce the level of incentive if pre-set spending levels are reached, the impact would be (if nothing else changes) to reduce the rate of return for new applications. This is partly to control potential overcompensation, but also would decrease the likelihood of activating the cap.
  - **Caps:** designed to give additional certainty about the potential for overspending on RHI.
- 15.5. Budget management in the RHI to date has relied solely on degression, which was designed to strike a balance between controlling spend and providing certainty to industry and consumers. Degression has kept the RHI within its budget allocation for each financial year of operation up until this point.
- 15.6. However, degression alone cannot guarantee that expenditure will not breach budgets. This is because while degression leads to reduced tariffs for new deployment, the RHI is demand led so deployment could continue to come forward even at significantly degressed tariff levels.
- 15.7. Within RHI there are three caps in place. Each cap has a specific function, these are:
- **Budget cap:** designed to control spending and ensure that the scheme does not overspend. Applies to the whole scheme.
  - **Value for money cap:** Limits tariffs to a set level to protect the value for money of support within RHI. Applies to setting tariffs.
  - **Heat demand caps:** For the domestic scheme to control potential for over-compensation. Applies to payments to householders.

#### *Degression*

- 15.8. Over time we expect the costs of renewable heat equipment and installation to fall as the industry matures and economies of scale are achieved, both in the UK and globally. A degression mechanism is used to control spend and prevent overcompensation. It is a feature of other (European) renewable electricity incentive schemes, including the FIT scheme.
- 15.9. If technologies are deploying above forecast levels to avoid overcompensation, tariffs will be reduced for new applicants to the scheme as spend on that particular tariff reaches pre-set triggers (amounts of budget). Tariff triggers mean that a tariff will

only be degressed if more people are taking up that technology than we anticipate. This ensures that a mix of technologies is supported and that we are not over compensating any particular technology. Tariff announcements take place quarterly, with one month's notice of any reduction of tariffs. Degressions take place in addition to the scheduled reviews of support.

15.10. Degression has:

- Improved value for money for the taxpayer; reducing tariffs where high growth has been experienced.
- Kept RHI spend within our overall budget.
- Provided certainty to the market and investors compared to other budget control mechanisms by ensuring sufficient transparency in likely future tariffs, when compared with other options, such as unplanned tariff reviews.

15.11. Degression continues to be the primary budget management mechanism designed to keep expenditure within budget with the budget cap remaining a back-stop to provide assurance there is a mechanism in place to prevent further commitments if there is a risk the budget could be breached. Degression will allow the scheme to remain open if deployment is high and reduces the risk of the budget cap being deployed. Through reducing the tariffs of those technologies deploying above expectations, it lessens the impact on the budget of any further deployment.

## State aid assessment of the measure

### GENERAL ASSESSMENT OF THE SCHEME

#### 16. Existence of State aid

- 16.1. The UK Government has considered the application of Article 107(3) TFEU to the proposed intervention and contends that any aid granted under the RHI scheme should be considered compatible as aid to promote environmental protection. The UK Government has assessed any aid for energy from renewable sources under the RHI in line with the Guidelines.
- 16.2. The RHI scheme is open to all individuals and organisations in the domestic and non-domestic sector, ranging from households and small businesses to large industrial organisations. As approved in previous assessments of the RHI scheme, we believe that for State aid purposes the scheme can be divided into two elements; a State aid element and a non-State aid element.
- 16.3. The UK considers householders who own eligible heat installations and use them for the sole purpose of generating heating for their private use within their home would not fall within the scope of Article 107 of the TFEU as they are not undertakings. Therefore we do not consider payment of tariffs to households to be state aid.

- 16.4. Landlords are, however, likely to be considered undertakings and RHI payments to these individuals may therefore fall within the scope of Article 107 of the TFEU. This view which is consistent with a previous assessment of the extension of the RHI to the domestic sector (case number SA.35766).
- 16.5. Under the non-domestic scheme, the UK considers that RHI payments to undertakings, in relation to the outlined changes to support could fall within the scope of Article 107 of the Treaty on the Functioning of the European Union (TFEU). The RHI is funded from the general Government budget and therefore involves State resources. It selects only certain technologies for heat production, as opposed to conventional or other renewable heat production technologies. Through tariffs, it provides renewable heat producers with an advantage that cannot be found under normal market conditions.
- 16.6. As the beneficiaries include undertakings involved in intra-EU operations, it threatens to distort competition and affect trade between Member States.
- 16.7. The RHI scheme has previously been assessed under former 2008 Guidelines on State aid for Environmental Protection as a notified measure concerning operating aid to undertakings in both the domestic and non-domestic sectors. The current notified measure does not affect this judgement – the RHI concerns operating aid granted to energy from renewable sources according to Section 3.3.2 of the 2014 Guidelines.
17. Requirement for a detailed assessment of individual projects
- 17.1. Section 2, paragraph 20 of the Guidelines requires that the Commission is notified of, and will individually assess, any individual case of operating aid for the combined production of renewable heat when the aid is granted to installations in sites when the resulting renewable electricity generation capacity exceeds 250MW (unless granted on the basis of a competitive bidding process).
- 17.2. We do not envisage any plants with an electrical capacity of 250MW or over seeking support on the RHI. If such plants do come forward the UK will comply with the requirement to undertake a detailed assessment and make an assessment of additional conditions for individually notifiable aid under Common Assessment Principles.
18. Legality of State aid
- 18.1. The UK is notifying the proposed changes to the RHI before their implementation (via regulations to be laid in Parliament in early 2017) and is therefore fulfilling its obligation under Article 108(3) of the TFEU.

## COMPATIBILITY OF THE STATE AID WITH THE GUIDELINES

19. Contribution to an objective of common interest

19.1. The general objective of environmental aid is to increase the level of environmental protection compared to the level that would be achieved in the absence of the aid. The core objectives of the RHI remain the same, with the primary objective of environmental protection. The UK Government wishes to continue to help develop the low carbon heat market and supply chain so that it is in a position to support the mass roll out of heating technology required in the 2020s and onwards. This is in order to meet decarbonisation targets and to contribute to renewable energy generation in order to help the UK meet its 2020 target for sourcing 15% of energy demand from renewables.

19.2. In addition, the RHI scheme aims to drive a step change in the uptake of renewable heat generation by providing targeted financial support to a wide range of renewable heat technologies.

19.3. The RHI scheme will also make a contribution to the UK's share of the European carbon reduction target. We also expect the scheme to have a positive impact on security of supply by reducing the dependence on fossil fuels. We believe that the scheme will help increase public engagement on energy use which could see a change in behaviour in terms of renewable energy as well as energy efficiency, create green jobs and build supply chains<sup>12</sup>.

20. Need for State intervention

20.1. The presence of a market failure which demonstrates the need for state intervention in the renewable heat sector in the UK remains consistent with previous assessments of the RHI scheme. State intervention is required as renewable heat technologies are currently unable to compete financially with fossil fuel alternatives. Without financial support, the private sector is not expected to invest sufficiently to achieve the required uptake levels. If this market failure is not addressed, it will impact on the UK's ability to meet legally binding targets for renewable energy and carbon emissions. We expect that by increasing the uptake of renewable heat technologies, the RHI scheme will enhance competition and drive down the cost of equipment and installation.

21. Appropriateness of the aid measure

21.1. The renewable heat market is largely undeveloped and has been identified as a sector that could and will have to provide a strong contribution to the UK Government's target of 15% of energy from renewables by 2020 if the target is to be

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<sup>12</sup> <https://www.gov.uk/government/collections/renewable-heat-incentive-evaluation>

met. Currently these technologies are unable to compete financially with fossil fuel alternatives and there are a number of market failures that prevent their deployment such as information asymmetries, perceived risks associated with new technologies, and costs of disruption associated with switching. Without government intervention, the private sector is not expected to invest sufficiently to achieve the required uptake levels.

- 21.2. Whilst the long-term vision is of widespread renewable heat use, before the implementation of the RHI, the number of such systems being installed in the UK was very low. A subsidy scheme was therefore needed to boost investment and uptake and drive down the costs of renewable heating systems as a result.
- 21.3. In addition to incentivising deployment the RHI scheme helps to support green jobs and develop the skills to install and maintain equipment in the future. The domestic RHI scheme offers this as well as the security of government support for consumers if making the transition to renewable heat early.
- 21.4. The financial support provided by the RHI scheme is in the form of a range of pence/kWh RHI tariffs for useful heat generated from renewable technologies. The UK Government believes that this measure is appropriate for several reasons:
- Financial support in the form of a range of pence/kWh is similar to FITs for renewable electricity both in the UK and other countries.
  - The RHI is well established. It has been in operation since 2011 (non-domestic) and 2014 (domestic). The UK Government is publicly committed to providing RHI support until at least 2020/21. The Commission has deemed the RHI appropriate by way of approval in four separate notifications; including SA.32125 (introduction of the RHI to the non-domestic sector), SA.36345 (air quality requirements); SA.37562 (amendments to the non-domestic RHI) and SA.35766 (extension of the RHI to the domestic sector).
  - A tariff based scheme was favoured over providing upfront grants because it reduces the impact on Government funding; spreading the costs over the course of seven and 20 years is more palatable than front loading grant payments.
  - Tariffs allow the Government to link payments to carbon abatement and renewable heat production. Due to metering in the non-domestic scheme, if renewable heat production stops, so will payments. Providing upfront grants offers the Government less control over the benefits of the subsidy. Furthermore, subsidies paid in instalments encourage beneficiaries to maintain equipment. On the domestic scheme, where a deeming calculation is used to estimate heat demand an annual statement is required confirming that equipment is in good working order.

- Requiring beneficiaries to front the capital cost of equipment ensures that the beneficiary has a stake in the functioning of equipment and the production of renewable heat. It also assists with reducing the impact on the distortion of competition as benefits are only realised over a substantial period of time.

21.5. Moreover, deployment figures show that, to date, the RHI has led to the successful deployment of eligible technologies, further demonstrating the effectiveness and thus appropriateness of the measure to develop the renewable heat market and meet the UK's legally binding targets<sup>13</sup>.

## 22. Incentive effect

22.1. State aid provides an incentive effect if the aid changes the recipients' behaviour towards reaching the objectives of common interest. The general objective of environmental aid is to increase the level of environmental protection compared to the level that would be achieved in the absence of the aid.

22.2. RHI tariffs provide an incentive effect for generators of renewable heat by:

- compensating the difference in up-front and on-going costs between renewable and fossil fuel generated heat
- providing additional compensation to overcome non-financial barriers associated with the uptake of renewable technologies
- paying generators a return on the up-front investment (in order to compensate for the financial opportunity costs of the additional capital expenditure).

22.3. Compensation for the capital costs includes the difference between the conventional and renewable technology while applying a discount rate on this differential over the technology lifetime to calculate the annualised upfront payment. Compensation for the operating costs (including fuel costs) is the difference between the conventional and renewable technology. Non-financial barriers are barriers associated with the renewable technology under the relevant counterfactual.

22.4. Rates of return have been set at a level that avoids overcompensation across technologies while providing sufficient support to bring forward a level of ambition for renewable heat up to 2020 required to meet the UK's legally binding renewables target.

22.5. The target rate of return for all technologies is 12% for the non-domestic sector and 7.5% for the domestic sector. These rates have been determined based on analysis by consultants and feedback from a wide range of stakeholders.

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<sup>13</sup> See incentive effect section below.

*Deployment*

- 22.6. An incentive effect can be evidenced to date by the growth of eligible technologies accredited under the RHI. Before the introduction of the RHI the UK market for these technologies was very immature and as such environmental protection from heat production was very limited.
- 22.7. In the non-domestic scheme, to the end of July 2016, 15,093 installations have been accredited. Heat generated and paid for totals 9,618 GWh (including biomethane injected to the grid). On the domestic scheme, to the end of July, 50,394 installations have been accredited. Heat generated and paid for totals 1,051 GWh. Based on stock data to end-Jun 2016 the estimated carbon savings from the RHI in 2015/16 is 2088kTCO<sub>2</sub>e.

*NatCen evaluation*

- 22.8. Research on the domestic RHI undertaken by NatCen Social Research, Centre for Sustainable Economics, Eunomia Research and Consulting and Frontier Economics on behalf of BEIS also provides an insight into the incentive effect provided by the RHI. It suggests that being able to claim the RHI was the single main reason for choosing a renewable technology mentioned by the most applicants. They also found that RHI is an important lever in promoting the decision to install renewable heating technologies. Almost half of all owner-occupier new applicants said that, without the RHI, they would either not have replaced their heating system at all or would have installed a non-renewable technology. Furthermore, the RHI tariff influenced the technology choice of 72% of applicants.
- 22.9. On the non-domestic scheme financial factors represent the main motivation for investment in renewable heating technologies for 71% of respondents to the applicant survey including the income available from the RHI (43%). For RHI applicants, environmental factors do not appear to be a major trigger for installation of a new heating system.

*Motivation*

- 22.10. In order to be eligible for the RHI, applicants must comply with various eligibility criteria. If these criteria are not met then the applicants will not be given support. As such, applicants are installing renewable heating systems in line with the requirements of the RHI; if they were not motivated by the promise of support under the RHI they would not be concerned with such criteria.
- 22.11. The structure of the RHI requires applicants to have purchased, installed and commissioned eligible renewable heating technologies before applying for aid. The UK maintains its previous position that whilst projects must be completed prior to the aid application applicants are motivated by the promise of support granted under



the RHI. The assessment in the Commission's previous Decision on the compatibility of both the domestic and non-domestic RHI regarding this approach to the incentive effect applies equally to the reformed RHI.

#### *Application forms*

- 22.12. The RHI scheme is administered by the delivery arm of Ofgem. Ofgem manages the scheme and is the granting authority that will determine, in accordance with the criteria in the Regulations, which individual beneficiary is eligible for RHI support.
- 22.13. If applicants meet the scheme requirements there is no discretion to the administration as to reject an application if all the criteria have been fulfilled.
- 22.14. Ofgem use application forms which potential participants must complete in order to apply to both the domestic and non-domestic RHI schemes. We are working closely with Ofgem in order to fulfil the requirement to include all of the information stipulated in paragraph 51 of the Guidelines on State aid for environmental protection and energy 2014-2020 ahead of our formal notification. With regards to counterfactual scenarios, RHI tariffs are set to compensate the difference between renewable technologies and fossil-fuel counterfactual, therefore it is always assumed that counterfactual is more expensive and would otherwise not be invested in.

#### *Shared ground loop systems*

22.15. Our evidence suggests that roughly half the costs of ground source heat pumps (GSHPs) are related to the installation of the plant, rather than the equipment itself. Most of the potential cost reductions require supply chain improvements so are best realised through greater uptake, which promotes learning and economies of scale. Systems in which multiple heat pumps share a common ground loop represent an attractive way of installing GSHPs and we are therefore keen to facilitate their deployment.

22.1. In addition, the tariff setting process for a single GSHP system results in a suggested tariff that is over the value for money (VfM) cap<sup>14</sup> and the tariff is constrained accordingly. This suggests that single systems do not attain the target rate of return. Therefore there is relatively low risk of significant overcompensation if the same tariff rate is offered for shared systems.

22.2. Deeming shared ground loops provides the benefit of increased certainty in payments. The deeming method mirrors the Domestic RHI and deeming is based on modelled heat demand, using the heat demand calculated in their Energy Performance Certificate, a method agreed by the Commission in SA.35766, paragraph 15.

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<sup>14</sup> (an upper limit on tariffs imposed by our finance ministry)

*Assignment of Rights (AoR)*

- 22.3. AoR is expected to help domestic applicants who are less able to pay to overcome the barrier of access to credit currently holding back deployment. A recent call for evidence indicated that the capital cost of renewable heat installations was a major barrier to effective take up of the technology, and that the introduction of third party financing would help to overcome this.
- 22.4. We expect that with the introduction of AoR, consumers with lower credit scores and/or less ability to access financing to be incentivised to install renewable heat technology where they had not been previously.
- 22.5. Proportionality of aid
- 22.6. Environmental and energy aid is considered to be proportionate if the aid amount per beneficiary is limited to the minimum needed to achieve the environmental protection or energy objective aimed for.
- 22.7. RHI support for the generation of renewable heat varies by technology and installation to ensure that the financial support is targeted and avoids overcompensation.
- 22.8. Tariffs are calculated to cover the cost difference between heat generated from renewable technologies and heat generated from fossil fuels (the fossil fuel counterfactual).
- 22.9. The tariff setting methodology is described in more detail in Annex A and an overview of the RHI tariffs is included in Annex B.
- 22.10. The tariff calculation methodology takes into account several components of cost which differ between the renewable and counterfactual heating technology, including:
- **Additional capital cost:** The compensation for net capital costs is required because renewable heating systems are typically significantly more expensive to install than conventional systems
  - **Differences in operating and fuel costs:** Changes in the required maintenance, as well as the type and amount of fuel used can impact the ongoing costs faced by consumers. These can either be savings or increases depending on the case.
- 22.11. The installation of renewable heating systems often faces additional barriers when compared with fossil fuel heating systems requiring a financial rate of return to overcome, such as disruption, hassle, additional work on the building and a risk premium associated with the less well known technology. Additional returns are

assumed to be required in the non-domestic scheme to compensate for the opportunity cost of funding the installation of the measure.

- 22.12. Participants will be committing to large upfront costs with several key uncertainties; performance risk, risk of access to subsidies, risk to property value and hassle costs. Applicants will require some financial compensation to overcome these barriers.

*Non-domestic RHI*

- 22.13. The UK Government has considered the best approach to the treatment of financial and non-financial barrier costs under the RHI. BEIS commissioned detailed reports from an independent consultant which concluded that the necessary rate of return to incentivise renewable heat production in the non-domestic scheme was between 8% and 20%.
- 22.14. In the non-domestic scheme we have set the rate of return at 12% for the non-domestic sector across all technologies, with the exception of solar thermal to which we have applied a lower rate of return (5%). The proposed rates have been determined based on analysis by our consultants, feedback from a wide range of stakeholders, and by considering the difference between renewable heat and renewable electricity.
- 22.15. The 12% rate of return is higher than the rate of return offered by FITs for renewable electricity (5-8%). The higher return reflects the higher uncertainty and unfamiliarity of renewable heat technologies and the stringent payback criteria that organisations investing in renewable heat technologies are expected to require. The rate of return has been set at a level that avoids overcompensation across technologies and segments (as support is set at the lower end of the 5-30% required rate of return range estimated by consultants) while providing sufficient support to bring forward a level of ambition for renewable heat up to 2020 required to meet the UK's legally binding renewables target.
- 22.16. It should be noted that the rate of return is based on the characteristics of the reference installation selected for the tariff setting. The actual rate of return that different investments will receive will depend on the costs that these installations face compared to the reference installation. To avoid the risk of overcompensation, the RHI tariffs have been banded to most effectively target support to the costs of the installations. As more information becomes available on the different costs that could prevail across technologies and scales RHI policy will continue to evolve through regular reviews to eliminate overcompensation as far as possible and maximise value for money.

*Domestic RHI*

- 22.17. In conjunction with the non-domestic RHI, BEIS commissioned a detailed report from an independent consultant, NERA. The report concluded that the necessary rate of return to incentivise renewable heat production for domestic properties ranges between 8 and 32%. This indicates that householders require a greater rate of return than non-domestic organisations in order to invest in renewable heating. The NERA analysis concluded that the rate of return domestic households needed in a “mid-low” case was 16%. This is towards the lower end of the range of available evidence and conservatively reflects the compensation householders may require. It also is within the range of non-domestic rate of return, though is in the centre of the range.
- 22.18. This rate of return was designed to cover the cost of financing on the additional upfront installation costs (the financial costs). We anticipate that householders will finance the upfront costs of their installation in a range of different ways, including savings, mortgages and commercial loans – some of which may have financing costs of higher than 7.5%, and some lower. We also took into account the cost of financing energy efficiency improvements through the Government’s Green Deal programme where the Green Deal Finance Company offered finance with an interest rate of 7.5 - 8% APR. We believe that on aggregate, using a rate of 7.5% is an appropriate level and will not lead to overcompensation.

*Tariffs set based on off gas grid homes only*

- 22.19. The domestic RHI is focussed on off-gas grid areas which are currently heating homes through expensive oil or electric heating options. These properties typically face higher energy bills and energy price uncertainty, so provide more cost-effective opportunities for renewable heating. These properties are also generally more carbon intensive. The tariffs have been determined using oil and electric heating as the counterfactual. When considering the entire UK housing stock, adopting this approach means that less than 50% of the heat potential will be incentivised avoiding any possibility of overcompensation in aggregate. Focusing the domestic RHI in this way is consistent with the UK’s Heat Strategy which set out that the early focus of deployment for renewable heat should be the off-gas grid sector of the housing stock.

*Updated evidence*

- 22.20. The tariffs available to different technologies may have changed over time due to tariff adjustments after receipt of additional evidence during well-defined tariff reviews and consultation period, corrections to the technology cost data and assumptions or degressions which lower tariffs automatically when deployment reaches certain levels.
- 22.21. There have been a number of updates to the evidence base that is used to determine

## NOTIFICATION OF AMENDMENTS TO THE UK RENEWABLE HEAT INCENTIVE (RHI) SCHEME

tariffs. These updates are primarily routine in nature as more evidence becomes available from the operation of the scheme, but can influence our understanding of the level of support needed. The main changes have been:

- Cost and performance assumptions – including the capital costs of equipment, and the load factors, for both the renewable and counterfactual technologies
- Fuel prices – both counterfactual fossil fuel prices and electricity prices faced by heat pumps have been updated in line with BEIS publications. The oil price particularly has decreased significantly compared to our previous assessment. For this assessment we use BEIS’s 2015 projections.

22.22. As with previous tariff setting analysis we have retained the method of using design performance to set tariffs and used in-situ performance for appraisal. This method helps avoid offering a higher tariff for systems which perform poorly.

22.23. The non-domestic and domestic scheme tariffs differ in a number of key ways, as summarised in the table below:

Property	Domestic Scheme	Non-Domestic
Period payable	7 years	20 years
Rate of return on additional investment when setting tariff support for the reference installation	7.5%	12%
Payment basis	Deemed renewable heat output (metering required for bivalent systems and second homes)	Metered total heat output for eligible heat uses
Payment timing	Quarterly in arrears (following submission of meter readings for metered systems)	Quarterly in arrears when meter reading provided.
Degression	Tariffs can be reduced (degressed) if spending hits certain triggers	
Other requirements (examples)	Microgeneration Certification Scheme (MCS) certification, Energy Performance Certificate and loft and cavity wall insulation where appropriate Sustainability requirements for biomass installations Metering standards.	Various (e.g. Coefficient of performance (COP) levels for heat pumps and design standards), Combined Heat and Power Quality Assurance (CHPQA) for Combined Heat and Power (CHP) systems) Sustainability requirements for biomass, biogas and biomethane installations Metering standards.

22.24. Scheme tariffs are not intended to offer a fixed rate of return to all installations for the duration of the scheme. Instead they act as a guide to the rate of return targeted when we set tariffs. There are many reasons why a householder or business may not achieve the above rate of return. For example, there is significant heterogeneity in the building stock and in the operation of renewable heating installations. In addition, the function of degression is to protect budgets, ensure that there is diversity of deployment and value for money, so that over time the actual rate of return may well change.

*Introducing assignment of rights*

22.25. We intend to treat AoR installations as closely as possible to comparable non-AoR installations. We do not intend to exclude or restrict any technologies, have separate tariffs, degression triggers or budget caps specifically for AoR installations.

22.26. The UK does not consider that finance providers will be over compensated as they will face additional costs including administration and overheads. In addition the implied rate of return required for investors is uncertain and depends on a number of factors:

- Base cost of capital – the cost of capital that financiers are able to access will depend on the competing investment options.
- Compliance risk premium – The RHI tariff is only payable if the consumer complies with the scheme terms and conditions. There is a risk that the user may not comply and so the financier will not receive the RHI payments. Financiers will likely demand a risk premium to cover the possibility of non-compliance. This is a principal (financier) – agent (consumer) problem which could require some contractual or incentive sharing solution.
- Heat demand risk premium – For installations which are metered the RHI returns will vary depending on the heat use of the consumer. Financiers may wish to mitigate this risk by setting up a contract for the consumer to bear.

*Shared ground loop systems*

22.27. Our evidence suggests that roughly half the costs of a domestic GSHP are related to the actual installation of the plant, rather than the equipment itself.

22.28. Stakeholders have suggested that the additional costs and administrative burdens associated with the metering requirements, as well as uncertainty regarding RHI payments are both barriers to deployment under the Non-Domestic RHI.

22.29. It is likely that shared ground loop systems will have lower capital costs per installation than single system GSHPs as the drilling and borehole costs are likely to see economies of scale. However there is little evidence to date on the costs of these systems in the UK.

22.30. Given that the tariff setting process indicated that the tariff for single GSHP systems should be over the value for money cap, we judge that there is relatively low risk of significant overcompensation if a tariff rate at the value for money cap is offered for shared systems.

22.31. We are confident that this will not lead to overcompensation as it is evident that a shared loop will need to be larger (and therefore more expensive) than an individual loop for a property. There are likely to be other costs associated with this type of system when installed by landlords, such as training residents in the use of their new heating systems and higher administrative costs, on which we seek further evidence.

*Amendments to biomass banding and biomass tiers*

22.32. The tariff setting methodology is unchanged from previous tariff setting exercises. The tariff is set on a 4MW plant replacing heating which uses a 50/50 mix of oil and gas. This is because our judgement, based on our market intelligence, is that a 4MW plant is the typical type of plant which may come forward under these proposals. We maintain the approach of offering a cumulative 12% return on additional costs, based on previous analysis of the required rates of return for investment (see annex A).

22.33. Smaller (<999kW) sized installations will still be eligible for the scheme, and the tariff may prove attractive for cost effective installations, particularly those with low capital costs, or which have high heat load factors (see annex B).

23. Cumulation

23.1. Under the non-domestic scheme, the UK will ensure that no RHI tariff can be cumulated with investment aid as recognised by the Commission in their original approval of the scheme (case number SA.32125, paragraph 59). Changes in this pre-notification do not impact on the Commission's previous decision.

23.2. CHP technologies can be supported by more than one incentive scheme because they can generate both renewable heat and electricity.

23.3. In the domestic scheme, the RHI does not interact with any other State aid so no cumulation issues arise.

23.4. To avoid overcompensation and cumulation, RHI support will only be available if the renewable heat installation in question has not received (and will not receive) any other State aid. If it has, the money will have to be paid back.

23.5. Where any State aid covers different costs than those covered by the RHI scheme, this could be combined with RHI payments as we believe this would be in line with the Guidelines.

23.6. This will be checked by the RHI scheme administrator as part of the accreditation and

registrations process. The potential beneficiary will be asked to provide information on other forms of funding.

#### 24. Avoidance of undue negative effects

- 24.1. RHI tariffs aim to compensate the additional costs of the renewable heat equipment and for the higher risks and uncertainties associated with its use. Therefore subsidies received by firms under the non-domestic RHI for the installation of a renewable technology are not expected to impact on the competitiveness of these firms relative to other firms that operate in the same market and choose fossil fuels for their generation of heat.
- 24.2. The RHI is expected to have an impact on the competitiveness of the UK in the field of renewable heat technologies, both in terms of manufacturing, installation and maintenance. Firms that currently operate in those segments are expected to see an improvement in their market position relative to the counterfactual of no renewables support. Entry barriers are also expected to be lower than before as the RHI stimulates demand for the technologies and provides demand certainty for new entrants.
- 24.3. Support levels have and will continue to grow a very immature UK market promoting economies of scale and technological advance which drive manufacturing and supply chain costs downwards in the long term.
- 24.4. Effects are captured to a certain extent through the future learning rate assumptions. Scheduled reviews of the RHI will allow for these impacts to be monitored and better reflected in the scheme going forward.

#### *Biomass banding and tiers*

- 24.5. There has been relatively low deployment of large (>1MW) biomass systems versus medium (200-999kW) and, in particular, small systems (<200kW<sup>15</sup>).
- 24.6. Given the success of the RHI in growing the smaller-scale end of the non-domestic biomass market<sup>16</sup>, the UK Government believes it is now appropriate to refine existing policy to ensure biomass support is focussed on larger biomass and biomass for process and district-heating to encourage deployment that is sustainable without subsidy in the longer term.
- 24.7. We anticipate that this may drive the deployment of 20 large (>1MW) installations per year, with some deployment in the sub 1MW plant range, particularly for those

<sup>15</sup> To the end of June 2016 only 37 biomass installations were accredited in the large (>1MW) tariff band. This accounts for less than 1% of all non-domestic biomass accreditations.

<sup>16</sup> At the end of June 2016 there were 13,819 accredited small (<200kW) and medium (200-999kW) biomass installations on the non-domestic RHI, accounting for 99% of all non-domestic biomass accreditations..



installations which operate with high load factors.

- 24.8. The proposed changes to solid biomass support is expected to rebalance the scheme towards larger more cost effective plants.
- 24.9. Although smaller (<999kW) sized installations may receive a lower average payment than the current tariff provides, BEIS analysis indicates that the market will still prove to be attractive for cost effective installations.

*Shared ground loop systems*

- 24.10. This technology is already eligible under the non-domestic scheme. The main difference would be that there is no requirement for metering for payment purposes and annual payments would be calculated using deeming. As such, we do not think the impact on competition will change due to the introduction of shared ground loop systems on the non-domestic scheme using the deeming calculation.

*Assignment of Rights*

- 24.11. The UK does not envisage that the introduction of AoR will cause any additional undue negative effects on competition. A registered third party can be a person, organisation or community group that is neither the homeowner nor renewable heat installation owner. They must be a member of a relevant consumer code, approved by the Chartered Trading Standards Institute (CTSI). There is no requirement that investors must be based in the UK and applicants are free to choose any registered investor.

25. Transparency of aid

- 25.1. To ensure compliance with transparency requirements the UK Government commits to publishing the details of individual awards of aid over €500,000 on the European Commission's State Aid Transparency Award Module. This will include the publication of the information listed in Section 3.2.7 of the Guidelines, including beneficiaries' names and size, and the amount of type of aid granted. Ofgem, the scheme administrator will collect and publish the required information on behalf of the UK government and beneficiaries subject to the transparency requirements will be notified that such details are to be published on the Transparency Award Module.

26. Evaluation, Reporting and Monitoring

- 26.1. The UK Government acknowledges the requirement to provide an evaluation plan in line with the state aid modernisation initiative<sup>17</sup>. BEIS has commissioned NatCen (an

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<sup>17</sup> Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, EU State Aid Modernisation (SAM), 8.5.2012, COM(2012) 209 final.

external consultant) to provide a comprehensive evaluation of both the Domestic and Non-Domestic RHI schemes<sup>18</sup>. This has been published and looks at the effects of the scheme to date on consumers and the supply chain.

- 26.2. BEIS has submitted a draft evaluation plan for comment to the Commission on the 24<sup>th</sup> June, separate from this pre-notification. A further draft plan will be submitted shortly and a final version will be submitted alongside the notification.
- 26.3. The UK Government commits to complying with the annual reporting and monitoring obligations laid down in Section 6, paragraphs 252 and 253 of the Guidelines.
- 26.4. With regards to previous commitments to conduct scheduled reviews of the RHI scheme (see paragraph 25 of decision SA.32125), the UK undertook an early tariff review in May 2013. Deployment of some technologies was lower than expected. Given these low levels of uptake and additional evidence from stakeholders, the UK decided to re-examine the evidence on the assumptions and cost data used to set the level of tariffs when the scheme was launched. Updated tariff reviews came into effect on 28 May 2013. Furthermore, we undertook a review of the biomethane tariff in 2014/15.
- 26.5. In November 2015, the UK Government announced as part of the spending review its intention for spending on the Renewable Heat Incentive schemes to rise from £430 million in 2015/16 to £1.15 billion. The scheme has been reviewed in light of the spending review outcome to ensure that we can ensure each pound spent contributes to the UK Government's vision of secure, affordable and clean energy throughout the UK. We believe that this review satisfies the commitment to conduct reviews, outlined in our original notification.
- 26.6. For further information on evaluation please see the evaluation plan, submitted separately to the Commission.

#### GENERAL CONDITIONS FOR OPERATING AID TO ENERGY FROM RENEWABLE SOURCES

##### 27. Operating aid to bio-fuels

- 27.1. The UK Government fully supports the concept of the waste hierarchy, and key policies relating to the circular economy are focused on prevention, re-use and recycling. We continue to support these in preference to energy recovery and disposal options, where it is reasonable in the circumstances to do so. The UK is bound by the rules under the Waste Framework Directive which require the holders of waste to comply with the waste hierarchy.
- 27.2. The RHI provides support for the generation of renewable heat, including heat

<sup>18</sup> <https://www.gov.uk/government/collections/renewable-heat-incentive-evaluation>

sourced from waste biomass under the biomass, biogas and biomethane tariffs in the RHI. This allows heat that may otherwise have been wasted to be captured for a useful purpose.

- 27.3. For biogas and biomethane, food waste is commonly the main feedstock. The key actions in relation to food waste are measures targeting prevention.
- 27.4. The UK has established the priority order set out in the 2011 Guidance on applying the waste hierarchy<sup>19</sup>, which places anaerobic digestion (AD) above composting and other energy recovery technologies for the treatment of food and garden wastes. The UK has established that in keeping with the waste hierarchy, AD is the best way to process food waste that cannot be prevented or re-used (i.e. redistributed to people or sent to animal feed). This is due to the high greenhouse gas savings attributed to the prevention of emissions from food waste in landfill, and the displacement of a high fossil energy source<sup>20</sup>. To this end, support for food waste AD is a complimentary policy to encouraging source separated food waste collections. Agricultural wastes, such as manures and slurry, also provide emission savings in both the agricultural and energy sector, and therefore are preferable to other treatment options such as storage and spreading directly onto land<sup>21</sup>.
- 27.5. There is a risk that overcompensation or unlimited expansion of AD could ultimately encourage preventable food waste into AD. In 2015, the tariff for biomethane was set in a way which was consistent with the evidence provided under the biomethane tariff review<sup>22</sup>.
- 27.6. We are taking steps to ensure that RHI support for biomass waste under the biomass tariffs do not result in overcompensation, avoiding wastes being diverted away from recycling or re-use options. Heat generated from biomass derived from waste is supported as part of the standard biomass tariff in the non-domestic RHI scheme. As stated in our earlier iteration of this pre-notification, we propose to introduce two biomass tariff bands for new biomass installations. The reform of the existing biomass banding and tiering arrangements is aimed in part at addressing any overcompensation, and this applies equally to those using biomass contained in waste. Where deployment expectations for biomass systems, including biomass contained in waste, are exceeded the degression mechanism will instigate an automatic tariff reduction.
- 27.7. Recent market reports have indicated that biomass from residual waste continues to be available for the energy market<sup>23,24</sup> but we are not minded to encourage

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<sup>19</sup> <https://www.gov.uk/government/publications/guidance-on-applying-the-waste-hierarchy>

<sup>20</sup> <https://www.gov.uk/government/publications/anaerobic-digestion-strategy-and-action-plan>

<sup>21</sup> <https://www.gov.uk/government/statistics/agricultural-statistics-and-climate-change>

<sup>22</sup> <https://www.gov.uk/government/consultations/rhi-biomethane-injection-to-grid-tariff-review>

<sup>23</sup> <http://www.greeninvestmentbank.com/media/25376/gib-residual-waste-report-july-2014-final.pdf>

unchecked expansion. In order to ensure that the range of technologies supported by the RHI receive sufficient support, the proportion of budget allocation for biomass technologies is likely to be lower compared to the proportion spent on support for biomass thus far. This proportionately lower budget allocation is likely to limit the further expansion of biomass for heat, including those using biomass waste.

- 27.8. It may also be useful to note existing aspects of the RHI which seek to ensure that support for biomass wastes does not encourage activity which deviates from the waste hierarchy. For example, RHI support is only available for heat generated from the biomass portion of waste. So, where biomass waste is mixed with other combustible recyclates (such as plastics) the RHI should not prevent a material recovery process prior to heating where it is reasonable in the circumstances to do so. Biomass waste used in biomass CHP systems is also not eligible for the biomass CHP tariff, in recognition that waste biomass is likely to be cheaper than non-waste feedstocks, and therefore does not require tariff level consistent with other biomass CHP.
- 27.9. In general, woody biomass and refuse derived fuel prices tend to be broadly consistent with the waste hierarchy, whereby the cost tends to be higher (or the gate fee lower) for wastes that could more easily be re-used or recycled (e.g. re-conditioned timber commands a higher price than demolition timber or sawdust), and are therefore less likely to be used for energy.

#### CONDITIONS FOR OPERATING AID TO ENERGY FROM RENEWABLE SOURCES OTHER THAN ELECTRICITY

##### 28. Section 3.3.2.2 of the guidelines

- 28.1. In the UK's original State aid approval (SA.32125 paragraph 49) the Commission agreed that there is no relevant market price for heat, since in the UK, more than 98% of heat is generated on-site by its consumers. As such, the relevant comparison is between the renewable and conventional heat production prices.
- 28.2. As the RHI is provided on an ongoing basis, the upfront net capital costs are levelised by applying a rate of return or discount rate. Upfront demand-side barriers are also annuitised using a zero percent rate of return. All cost components are then expressed in p/kWh, added together, and rounded to deliver the tariff.
- 28.3. Levelised costs are annualised costs divided by annual heat output and include capital costs, operation and maintenance costs and fuel costs.
- 28.4. RHI tariffs provide an incentive effect for generators of renewable heat by:

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<sup>24</sup> [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/251567/pb13883-forecasting-2020-waste-arisings-131017.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/251567/pb13883-forecasting-2020-waste-arisings-131017.pdf)

- compensating the difference in up-front and ongoing costs between renewable and fossil fuel generated heat
  - providing additional compensation to overcome non-financial barriers associated with the uptake of renewable technologies
  - paying generators a return on the up-front investment (in order to compensate for the financial opportunity costs of the additional capital expenditure.
- 28.5. There have been a number of updates to the evidence base that is used to determine tariffs. These updates are primarily routine in nature as more evidence becomes available from the operation of the scheme, but can influence our understanding of the level of support needed.
- 28.6. The main changes have been:
- Cost and performance assumptions – including the capital costs of equipment, and the load factors, for both the renewable and counterfactual technologies
  - Fuel prices –both counterfactual fossil fuel prices and electricity prices faced by heat pumps have been updated in line with BEIS publications. The oil price particularly has decreased significantly compared to our previous assessment. For this assessment we use BEIS 2015 projections<sup>25</sup>.
- 28.7. BEIS carry out both internal evidence gathering (which is ongoing) and external evidence reviews (which occur only when we are seeking to make changes to the tariffs or their structures and require consultation). We regularly monitor markets through market intelligence gathering, and through monthly cost control reviews which includes assessing the latest deployment figures. This helps us to identify changes in the markets early, which we can then investigate further through closer analysis of the sector concerned. The design of the tariff degression mechanism allows it to act automatically, on a quarterly basis, to reduce the tariff offered to the market in response to increases in deployment which could result from reduced production or distribution costs among other sources.
- 28.8. BEIS will continue to review the production costs of renewable heat technologies based on emerging evidence from the scheme and other data sources as appropriate. Regular reviews ensure that the aid per unit of energy does not exceed the difference between the total levelised costs of producing energy.
- 28.9. In addition, degression is designed to reduce the level of support available to renewable technologies, if deployment has exceeded certain budgetary triggers.

### *Depreciation*

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<sup>25</sup> <https://www.gov.uk/government/collections/fossil-fuel-price-projections>

- 28.10. Payments are guaranteed for 20 years in the non-domestic scheme. This duration is based on evidence on the operational lifetime of installations which is approximately 20 years. Thus, the operating aid is limited to the depreciation time of the installations concerned (20 years), which corresponds to expected plant lifetime.
- 28.11. In the domestic scheme, tariffs are paid over seven years, for expected heat generation over 20 years where the majority of costs are normally incurred during installation. 20 years is the assumed operational lifetime of all of the eligible technologies. We consider a seven year payment period strikes the right balance between a payback period that appeals to consumers, Government budgetary constraints, and providing an incentive for continued use – and stakeholders have been supportive of this approach. For example, it is not unusual for consumer loans, finance or purchase agreements to be available over this approximate timescale, and it is also close to the average length of time that people in the UK remain in a property. In terms of subsidy payments and the pressure on budgets, the longer the payment period the greater the legacy cost issues to government; the shorter the payment period (three to five years), the more pressure there is on immediate budgets. The spending profile of a seven year tariff balances these two extremes.

## Annex A – Tariff setting methodology

### 1. Introduction

- 1.1. The principle for setting the majority of RHI tariffs remains unchanged. The tariffs aim to compensate the additional costs of installing renewable heat technologies. A typical reference installation is selected and the tariff is set based on the costs and benefits of a low carbon technology in that building.
- 1.2. The approach of constructing case studies allows us to better consider the offer to consumers and changes in financial incentives. It additionally enables us to better appraise the impact of the heat demand cap.
- 1.3. Previously tariff setting was based on incentivising 50% of the supply curve of renewable heat. The objective of this method was to avoid overcompensation while also setting the tariff that would work for a reasonable proportion of technical potential. This method however required a high bar of evidence, both for cost and performance, but also the potential market size. This has a high degree of uncertainty, particularly for non-domestic buildings.
- 1.4. The new tariff setting methodology retains the same overall objective as the previous one, but recognises evidence limitations. It uses the cost and performance information we have available to create a range of tariffs for different types of installation and targets what we expect to be the median installation. This approach allows us to be clearer about the impact tariffs might have.
- 1.5. In addition to the tariff level we have other tools for limiting overcompensation. These include degression, caps on payments in the domestic scheme and tiering and banding in the non-domestic scheme. Taken together, these provide assurance on overcompensation risk.
- 1.6. There have been a number of updates to the evidence base that is used to determine tariffs. These updates are primarily routine in nature as more evidence becomes available from the operation of the scheme, but can influence our understanding of the level of support needed. The main changes have been:
  - Cost and performance assumptions – including the capital costs of equipment, and the load factors, for both the renewable and counterfactual technologies;
  - Fuel prices –both counterfactual fossil fuel prices and electricity prices faced by heat pumps have been updated in line with BEIS publications. The oil price particularly has decreased significantly compared to our previous assessment. For this assessment we use BEIS’s 2015 projections.
- 1.7. As with previous tariff setting analysis we have retained the method of using design performance to set tariffs and used in-situ performance for appraisal. This method

helps avoid offering a higher tariff for systems which perform poorly. In our appraisal analysis we use a range of assumptions based on the interim RHPP metering data and the latest report.

## **2. Value for money cap**

- 2.1. When the non-domestic scheme was launched in November 2011, it was agreed that none of the tariffs should be set above the support provided to offshore wind. This approach was continued when the domestic scheme was launched in 2014. Paying more than this level was considered not to offer good value for money in terms of contributing to meet the 2020 renewable target. The revised cap level (set in 2014) of 10.0p/kWh represents the direct support cost of offshore wind in 2014/15 from the RO and also took into account the support received from Levy Exemption Certificates (LEC). The cap is equivalently set at 19.2p/kWh for seven year domestic tariffs taking into account the different payment lifetime.

## **3. Domestic tariffs**

### **3.1. Domestic heat pumps**

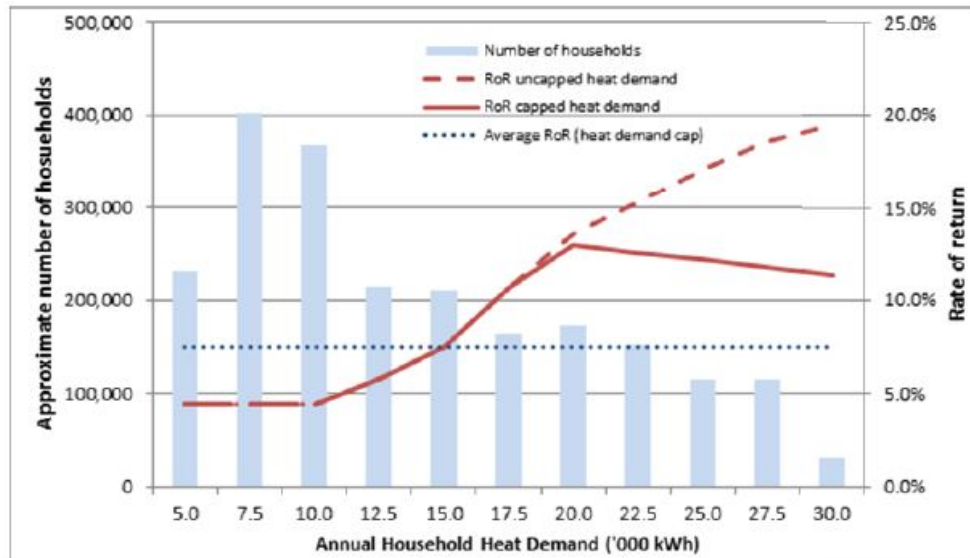
- 3.1.1. Deployment to date for domestic heat pumps has been steady, however below expectations. This is likely due to financial barriers (upfront costs, low rates of return for smaller systems) and non-financial barriers such as awareness and hassle. The RHI domestic evaluation highlighted that access to finance remained a barrier to further deployment.
- 3.1.2. The objective of our review of support for heat pumps is to drive deployment while ensuring we achieve value for money in the scheme and sufficiently incentivise high performing systems.
- 3.1.3. The choice of the reference installation is a judgement based on the size of house, current state of the market and potential over coming years. This choice also offers an appropriate rate of return to smaller households. The size detailed here is larger than the average household, however the target market for RHI remains off-gas grid homes, which do tend to be larger than average.
- 3.1.4. The tariff setting method remains unchanged from previous analysis. The proposed tariffs are based on achieving a 7.5% rate of return (the target rate of return set in previous consultation) for households with a heat demand of 14,000kWh (equivalent to a 10kW ASHP) and 17,000kWh (equivalent to a 12kW GSHP). This tariff setting process leads to a GSHP tariff above the value for money cap, so the proposed tariff is capped at that level.



*Air source heat pumps heat demand cap*

3.1.5. The chart below illustrates that under a flat tariff structure, expected returns from the scheme increases with household size (red line) and the return on offer if no cap was proposed (dotted red line). This is due to the fact that larger households offer the most cost effective proposition. In addition it sets out the market opportunity (blue bars).

Chart A1: Financial returns for ASHPs



3.1.6. Based on current application rates, around 75% of domestic ASHP applicants fall below the cap level. These smaller households could expect a return on their investment in the range of ~5-12.5%.

3.1.7. Households above the heat demand cap still retain a rate of return in excess of 10%. Whilst this is still in excess of the 7.5% target rate of return, this is below what they would have received without a cap (~20% return for households with a heat demand of 30,000kWh/year).

3.1.8. The proposed tariff change and cap structure ensures that the average capped rate of return (weighted by household) across our range of households is in line with the target 7.5%.

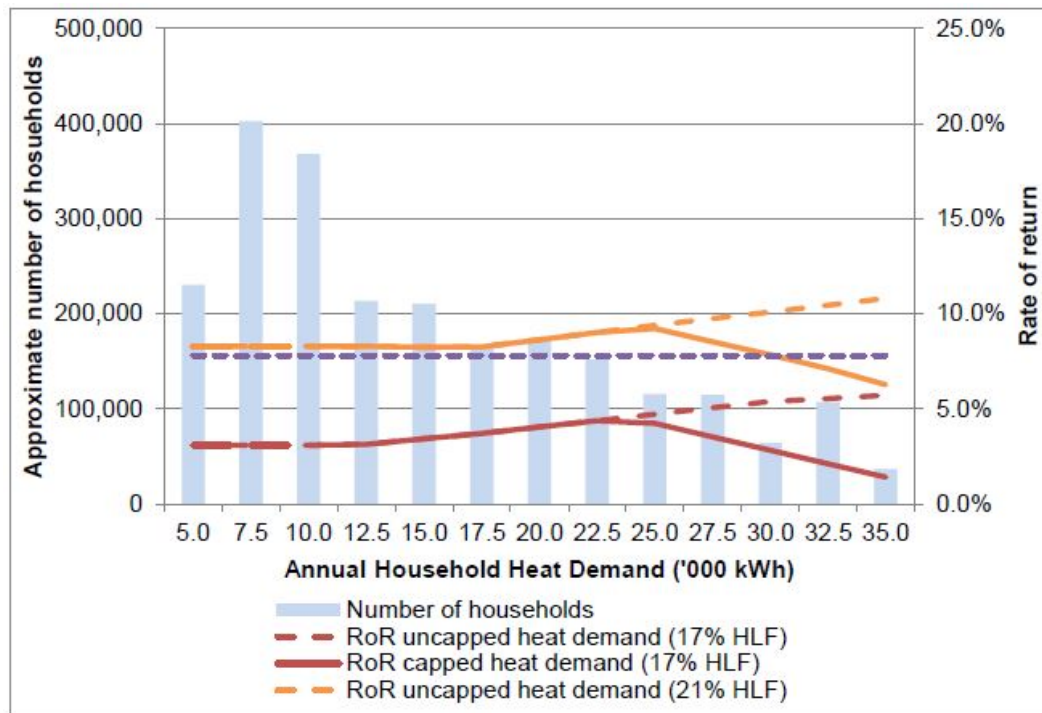
*Ground source heat pumps heat demand cap*

3.1.9. The group of households considered most appropriate for the installation of a GSHP system are those with an annual heat demand in the range of up to 35,000kWh. While larger systems do exist these are unlikely to deploy in the domestic sector currently.

3.1.10. The analysis below suggests that the expected returns from a GSHP installation is not as heavily influenced by household size compared to ASHP. This is because we anticipate much smaller economies of scale for GSHP compared to ASHPs.

3.1.11. The red line on the chart below indicates that based on our central assumptions setting. The tariff at the value for money cap, the tariff does not offer a 7.5% rate of return to households on average.

Chart A2: Financial returns for GSHPs



3.1.12. The changes to eligibility for GSHP could incentivise additional households, particularly small households, to come forward under shared ground loop systems. These systems incur lower capital costs and are more cost effective than standard systems. The above analysis indicates that our reference scenario could experience returns of ~7.5% from producing the same amount of heat through the installation of a GSHP shared loop system as cost reductions may reduce the upfront costs.

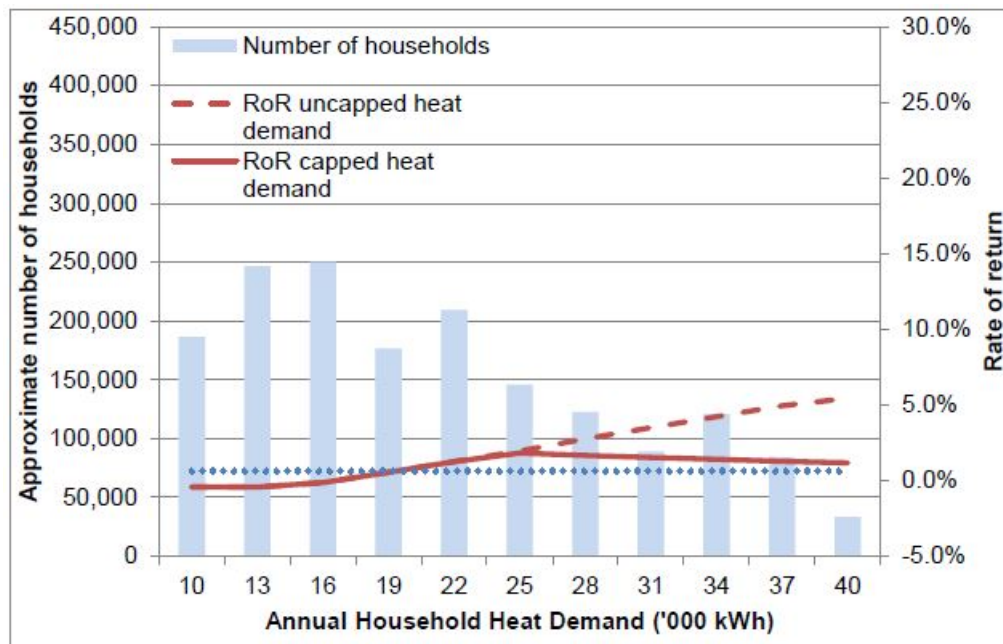
3.1.13. There are further opportunities to achieve the target 7.5% rate of return. The above analysis shows that a 7.5% rate of return is attainable for our reference household if the heat load factor for GSHPs was equal to 21% instead of 17%.

3.1.14. The heat demand cap serves the purpose of restricting the level of returns available for large installations that may experience these favourable conditions. The cap level for GSHP is set at a higher level than ASHP to ensure that rates of return fall for only the larger systems.

### 3.2. Domestic biomass

- 3.2.1. Biomass installations have been supported by the domestic RHI scheme since its inception in April 2014. Currently, support is provided for all eligible biomass systems that use an approved sustainable fuel.
- 3.2.2. This level of deployment exceeded expectation and budget allocations, and therefore triggered a series of depressions used to control expenditure. The domestic biomass tariff was initially set at 12.2p/kWh. It has since reduced to 5.2p/kWh. At least one further 10% depression is certain, with another 10% depression before April 2017 very likely. This would take the tariff to 4.21p/kWh. As a result deployment has fallen from a peak of around 2,800 applications in the final quarter of 2014, to under 700 in the third quarter of 2015.
- 3.2.3. The significant depressions to date for domestic biomass mean that the rate of return offered by the current tariff is significantly less than 7.5%, though the rate of return does vary significantly with the size of systems. In addition the introduction of a cap at the level of 25,000kWh/year will limit the rates of return available to the largest households.
- 3.2.4. However, market intelligence and consultation responses suggest that biomass is the most appropriate technology for decarbonising some households and heat demand limits will impact biomass most as high heat load houses tend to be large leaky off-gas properties that are more suited to biomass. As such, we have decided to reverse depression to domestic biomass to December 2015 levels (6.43p/kWh).
- 3.2.5. The chart below considers returns with a tariff of 6.43p/kWh, using central (4.7p/kWh) high (+25%) and low (-25%) fuel price assumptions.

Chart A3: Financial returns for biomass



#### 4. Non-domestic tariffs

- 4.1. The methodology for the majority of non-domestic tariffs has not changed since the Commission's approval (case number SA.32125). However, the non-domestic biomass tariff has been updated and is considered here.
- 4.2. The proposed tariff has been determined by calculating the level of support necessary to compensate the cost of switching for large plants that operate on a 50/50 mix of oil and gas. Specifically, this impact assessment considers the level of support necessary to compensate the costs incurred by an oil/gas plant switching to a 4MW biomass boiler.
- 4.3. To determine the appropriate tariff we used a Monte Carlo model which looked at the additional costs of a large biomass system and the variation around these assumptions to develop an appropriate range of tariffs for the consultation proposals.
- 4.4. Small and medium sized installations will tariff may prove attractive to the most cost effective installations, particularly those with low capital costs, or which have high heat load factors.
- 4.5. The rationale for amendments to the biomass banding, tiering and tariffs are centred on maximising the value for money and strategic value of the RHI support to the non-domestic biomass market.

*Input assumptions*

- 4.6. The input assumptions used for the counterfactual technology are in line with the assumptions used in previous tariff setting. It is assumed that a potential applicant wishing to install a 4MW biomass boiler would consider this against a 4MW oil boiler and a 4MW gas boiler, both with capital costs of £70/kW, load factors of 20% and fuel costs of 4p/kWh and 2p/kWh.

Chart A4: Non-domestic biomass input assumptions

Assumption	2016 Tariff Proposal	2016 Tariff Proposal	2016 Source
<b>Tier 1 tariff level (p/kWh)</b>	3.7	2.9	DECC Calculations
<b>Targeting methodology</b>	Small & Medium Biomass	Large Biomass	Policy Assumption
<b>Annual heat demand of target installation (kWh/yr)</b>	350,000	7,000,000	DECC Calculations
<b>Capacity (kW)</b>	200 (10 – 999)	4,000 (1,000– 8,000)	Policy Assumption
<b>Capex (£/kW)</b>	500 (300 – 900)	250 (150 – 800)	DECC judgement based on scheme data, AEA data
<b>Opex (£/kW)</b>	10 (6 – 23)	10 (6 – 23)	Judgement
<b>Design efficiency (%)</b>	75% (70 – 85)	75% (70 – 85)	DECC Judgement
<b>Lifetime (years)</b>	20	20	Policy assumption
<b>Heat Load Factor</b>	20% (15 – 35)	20% (15 – 35)	Calculated from Scheme Data
<b>Counterfactual technology</b>	50/50 oil and gas	50/50 oil and gas	Policy Assumption
<b>Tier 2 tariff level (p/kWh)</b>	2.05	2.05	DECC Calculations
<b>Fuel price (p/kWh)</b>	4 (3 – 5)	4 (3 – 5)	Market Intelligence

*Tariff sensitivity analysis*

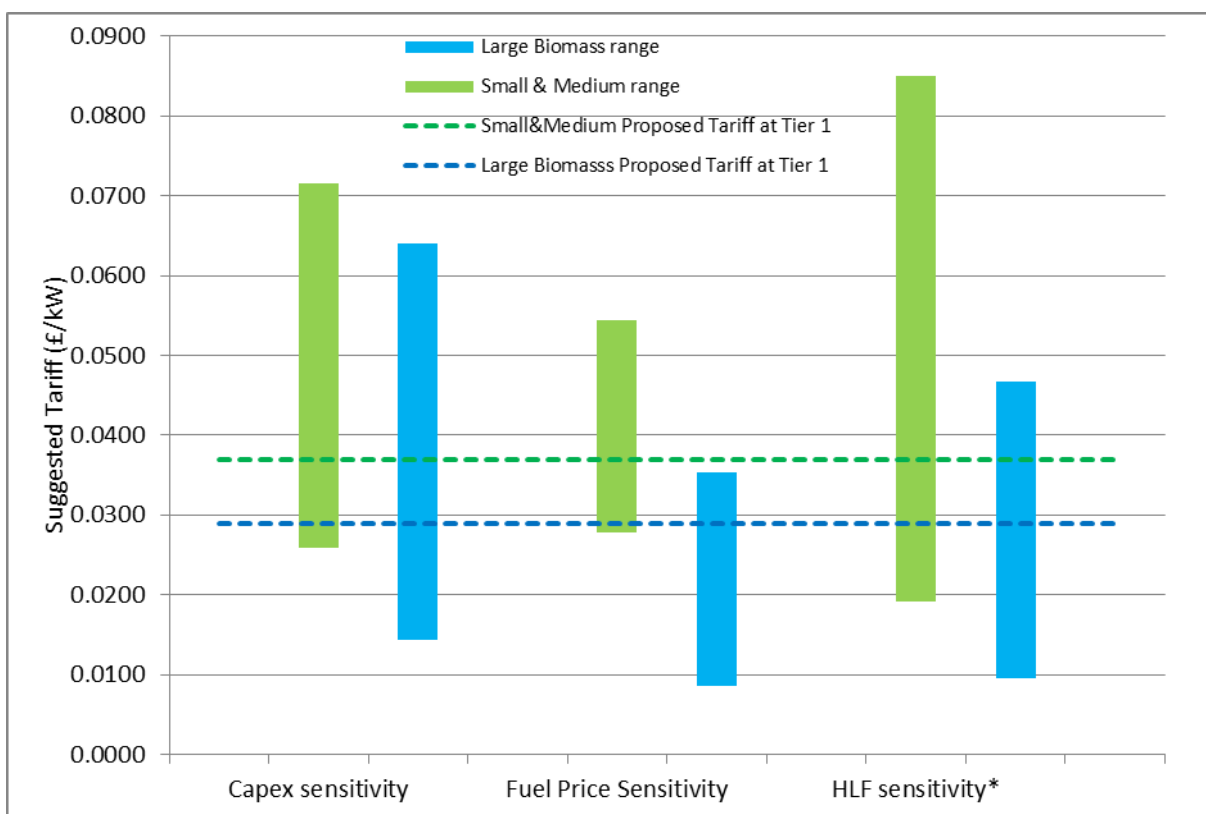
- 4.7. The range of tariffs suggested by the model is highly sensitive to a number of key technology specific cost and performance assumptions. The sensitivity analysis in this section tests how responsive the tariff is to changes in key assumptions that drive changes in the tariff level. These are discussed below.

- Fuel prices – Fuel costs make up a significant proportion of the total running costs of a project. Reducing the cost of biomass fuel would significantly reduce the level of financial compensation required and therefore under a

single tariff structure, could greatly alter the returns experienced. The central biomass fuel scenario assumes 4p/kW, high and low scenarios assume a 3p/kW and 5p/kW for all sized plants.

- Load factors – Load factor assumptions used for tariff setting have been inferred from scheme data. Three alternative load factor scenarios are tested below (10, 30 and 40%), an extreme high scenario is included to capture in our modelling plants that join the scheme and operate at very high load factors. The central scenario assumes both large and small and medium plants operate at a 20% heat load factor.
- Capital costs – Capital costs make up a significant proportion of the total lifetime cost of a renewable heating system, therefore can significantly influence the required level of financial compensation. Capital cost assumptions are established using DECC judgement which considers information from a number of sources. The central scenario used in the tariff calculation assumes a capital cost per kW of £250/kW for large plants and £500/kW for small and medium plants.

Chart A5: Variation in large biomass tariff



\* Heat load factor range; 10%/20%/30%/40%. The heat load factor sensitivity considers plants operating a heat load factor greater than the tariff tiering points 25% (small and medium biomass) and 35% (large biomass). As a result when considering such plants, it must be remembered that the average tariff that they receive will be influenced by tier 2 and therefore lower than the tier 1 tier presented on the chart above.

- 4.8. Our modelling calculates a 'suggested tariff' which is equal to the level of compensation required for a plant to achieve a 12% return on their investment. Given a set of plant characteristics, if the suggested tariff is below the proposed tariff then these plants would require less financial compensation than what they could expect from the proposed tariff and therefore could expect a return in excess of 12%. The length of the bars on the above chart shows the range of tariffs suggested by our modelling using high and low assumption scenarios.
- 4.9. Chart A25 illustrates that the suggested tier 1 tariff is highly sensitive to these three assumptions meaning that the returns realised will vary significantly by project. For instance, large plants that can source biomass fuel for 3p/kW rather than 4p/kW can expect returns over 12%. Alternatively, large plants that run at a heat load greater than 20% or face capital cost less than £250/kW can also expect returns over 12%. In reality we expect only a small minority of plants to experience these cost saving opportunities. The tier 2 tariff reduces the risk of overcompensation towards plants operating at high heat load factors. This is because a greater proportion of their payments will be paid under the tier 2 tariffs, thus limiting their potential returns. This is not shown on the chart.
- 4.10. In summary, a 'typical' 4MW biomass installation does not exist in the market. The cost and performance of installations vary significantly by project meaning that it is very likely that installations will realise capital or fuel costs across the whole range of scenarios mentioned above.

## Annex B – Proposed RHI tariffs

### Non-Domestic

Technology	Reform tariff (p/kWh)
Large biomass	Tier one (35%): 2.91 Tier two: 2.05
Solid biomass CHP	4.22
Ground/Water source heat pumps	Tier one: 8.95
	Tier two: 2.67
Air source heat pumps	2.57
Deep geothermal	5.14
Solar thermal	10.28
Biomethane injection	Tier one: 5.35 Tier two: 3.14 Tier three: 2.42
Small biogas combustion	4.43
Medium biogas combustion	3.47
Large biogas combustion	1.30

### Domestic

Technology	Reform tariff (p/kWh)
Biomass boilers	6.44p
Air source heat pumps	10.02p
Ground source heat pumps	19.55p
Solar thermal	19.74p



## Annex C – Overview scheme costs and benefits

### 1. Summary

- 1.1. The methodology for assessing cost and benefits uses market intelligence to assess deployment potential and then uses assumptions regarding costs, performance and use to quantify costs and benefits. The major assumption difference is the carbon emission abatement associated with biomethane, where we now take account of upstream methane emission abatement.
- 1.2. The total impacts of the RHI as a whole are summarised below. This includes RHI impacts for installations supported between 2011 and March 2016 and proposed changes:
  - Nominal spend - £1,139m by 2020/21
  - Renewable heat supported (RED definition) - 22.1TWh by 2020/21
  - Carbon savings - 21.2-41.6 MtCO<sub>2</sub>e by carbon budget four
  - Net present value (real discounted) £1,344m

### 2. Deployment and spend

- 2.1. The deployment seen under the RHI is critical to quantifying the potential benefits and the costs of RHI. We consider deployment potential in three parts to mirror the phases of the scheme:
  - deployment in 15/16 (under existing RHI rules)
  - deployment in 16/17 (under new triggers and other small scheme changes)
  - deployment under the reformed scheme to 2021.

### 3. High deployment scenario

- 3.1. A high deployment scenario could have a number of different results depending on how it interacts with the budget management system. Under one scenario, increased deployment might be as a result of lower costs, therefore the tariff could still offer a return for decision makers to invest in low carbon heat technologies. This scenario would see depression reduce average tariffs so enable more installations to be supported for the same total spend.
- 3.2. Alternatively the cap would be hit resulting in a scheme suspension. We would expect to re-open the scheme in the subsequent financial year, pending a review of the scheme.
- 3.3. Because of the variation in high scenarios, and the dependency of how and why depression or the scheme cap is triggered, we have not modelled a high scenario separately.

Table C1: Deployment scenarios

Scenario Name	Approach to 15/16	Approach to 16/17	Approach to 2017 to 2021
<b>High</b>	Limited by depression and the cap		
<b>Central: High</b>	Spend committed	High Overall Market Intelligence	Spend Budget
<b>Central</b>	Spend committed	Central Market Intelligence	Central Market Intelligence
<b>Central: Low</b>	Spend committed	Low Overall Market Intelligence*	Low Overall Market Intelligence*
<b>Low</b>	Spend committed	Low by Technology Market Intelligence	Low by Technology Market Intelligence

\*Takes the approach that the low market estimates for each technology are unlikely to all be realised at the same time.

Table C2: Nominal spend estimates under main deployment sensitivities

	2016/17	2017/18	2018/19	2019/20	2020/21
<b>Budget Cap</b>	£640m	£780m	£900m	£1,010m	£1,150m
<b>High</b>	£607m	£737m	£877m	£1,010m	£1,150m
<b>Central</b>	£596m	£722m	£857m	£979m	£1,103m
<b>Low</b>	£587m	£697m	£808m	£907m	£1,008m

3.4. The detailed appraisal analysis will be conducted on the central scenario. We will also summarise the high level conclusions for each of the other scenarios for reference.

#### 4. Renewable Heat Supported by RHI

4.1. We anticipate that by 2020/21 the RHI as a whole could deliver 22.3TWh of renewable heat, with a £1.15bn spending on the total scheme for the year. This could deliver 25-38MtCO<sub>2</sub>e of carbon abatement by Carbon Budget four<sup>26</sup>. This wide range reflects differing assumptions regarding the extent of upstream emissions abatement (as a result of diverting the food waste from landfill sites) and methane leakage during the anaerobic digestion process. We will gather further evidence as to the appropriate level of carbon savings to report.

<sup>26</sup> The fourth carbon budget, covering the years 2023-27, was set in 2011 at the level of 1,950 MtCO<sub>2</sub>e, a 50% reduction below the base year.

- 4.2. Due to new evidence being released on heat pump performance during the appraisal process, we have opted to provide two scenarios of renewable heat generated.

Table C3: Profile of renewable heat generation under the central scenario Renewable Heat Supported (Renewable Energy Directive, TWh)

	2016/17	2017/18	2018/19	2019/20	2020/21
<b>Biomass</b>	1.07	2.37	3.31	4.26	5.20
<b>Biomethane /Biogas</b>	1.24	2.86	4.01	5.15	6.29
<b>Heat pumps</b>	0.03	0.14	0.29	0.43	0.58
<b>Other</b>	0.00	0.02	0.04	0.06	0.08
<b>Total new deployment</b>	2.35	5.39	7.64	9.90	12.16
<b>Existing Scheme (of which Biomass, Biomethane, heat pumps)</b>	9.90 (6.75, 2.93,0.21)	9.90 (6.75, 2.93,0.21)	9.90 (6.75, 2.93,0.21)	9.90 (6.75, 2.93,0.21)	9.90 (6.75, 2.93,0.21)
<b>Baseline<sup>27</sup></b>	31.14	31.14	31.14	31.14	31.14
<b>Total Renewable Heat</b>	~43	~46	~49	~51	~53

Table C4: Renewable Heat under different deployment scenarios Renewable Heat Supported (Renewable Energy Directive, TWh) in 2020/21

	Existing scheme	Total new deployment
<b>Central: High</b>	9.90	13.42
<b>Central</b>	9.90	12.16
<b>Central: Low</b>	9.90	9.93
<b>Low</b>	9.90	7.67

- 4.3. The Central: High scenario delivers a lower level of deployment of renewable heat than the central scenario because it contains more deployment in 2016/17.

<sup>27</sup> The renewable heat generated outside the RHI. This is sourced from the DUKES 2014 assessment of the level of renewable heat generated in the UK, with the heat supported from RHI netted off. Further details can be found here:

[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/450069/dukes6\\_7.xls](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/450069/dukes6_7.xls)

Deployment after 2016/17 generally offers better value for money and carbon savings than before.

## 5. Greenhouse Gas Abatement

- 5.1. The greenhouse gas abatement which these proposals might support is dependent on the amount of heat supported by the RHI, the fossil fuel systems replaced and the efficiency of the systems.
- 5.2. The table below provides estimates of the carbon savings from RHI deployment over the next three carbon budget periods. There will be some additional benefits over the current carbon budget period up to 2018, but these will be small.
- 5.3. These carbon savings represent the lifecycle emission abatement, so as to properly take into account the carbon emissions from biomass.
- 5.4. As can be seen a large proportion of the savings arise from biomethane and biogas. This is largely due to the upstream savings arising from the use of the fuels within the creation of biogas. For example, if food waste was not used within the process, it would instead go to the landfill and generate more emissions. Within the table we have shown approximately how much of the savings are due to these avoided emissions within the brackets.
- 5.5. The significant uncertainty associated with upstream biomethane emissions means that we will present the carbon savings as a range, with and without upstream abatement.

Table C6: Profile of carbon savings under the central scenario Net carbon Savings (Mt CO<sub>2</sub>)

	CB3 2018 2022	CB4 2023 2027	CB5 2028 2032	Lifetime
Biomass	4.4	5.2	5.1	<b>20.7</b>
Biomethane/biogas (of which due to upstream savings)	16.7 (11.7)	20.2 (14.1)	20.2 (14.1)	<b>80.7 (56.5)</b>
Heat pumps <sup>28</sup>	0.9	1.3	1.3	<b>5.1</b>
Other	0.1	0.1	0.1	<b>0.4</b>

<sup>28</sup> Varying the performance of heat pumps has a small impact on the carbon abatement potential. Our analysis suggests using the latest RHPP evidence could reduce carbon abatement by ~2%. For simplicity we have just used the higher value here.

Total new deployment	10.4 - 22.1 (20.1)	12.6 - 26.7 (25.4)	12.6 – 26.7 (25.4)	<b>50.5 – 106.9</b> <b>(101.6)</b>
Existing Scheme	15.0 (14.3)	14.9 (14.2)	14.8 (14.1)	<b>59.7 (56.7)</b>
Total RHI Carbon Abatement (of which Non traded)	<b>18.4 - 37.1</b> <b>(35.2)</b>	<b>20.4 - 41.6</b> <b>(39.5)</b>	<b>20.2 - 41.4</b> <b>(39.4)</b>	<b>82.0 - 166.7</b> <b>(158.3)</b>

## 6. Monetised costs and benefits

6.1. The Net Present Value of the policy is designed to capture the costs and benefits of. The policy decision to society in general. In is made up of three main elements:

- **Resource Costs** – these present the additional costs to society of householders and businesses, this includes the additional capital and energy costs compared to a fossil fuel alternative.
- **Air Quality Impacts** – these are the monetised costs or benefits from replacing fossil fuel systems with RHI supported low carbon alternatives. The benefits accrue from reduced emissions of Nitrous Oxides and Particulate Matter.
- **Carbon Emissions** – these are the monetised benefits of carbon emission reductions from moving to low carbon alternatives. For this appraisal we look at the lifecycle emissions of fuels given the important part they play for biomass related heating systems.

6.2. There are other costs and benefits which it has not been possible to monetise, these are summarised below.

6.3. We calculate resource costs in a similar way to calculating the required tariff, we look at the additional costs of the renewable heating system compared to the fossil fuel alternative, but use a lower discount rate (3.5% as compared to the 7.5%/12% project discount rate) to reflect that some of the rate of return we pay as part of the tariff is not a social cost. The resource cost of renewable heating technologies is very uncertain; we include a sensitivity to illustrate this.

6.4. The appraisal presented in the section below shows our estimates of the impacts associated with deployment of renewable heat technologies supported on the RHI from the period of 2016/17 through 2020/21 inclusive. The renewable heating systems installed during this period have an assumed lifetime of 20 years<sup>36</sup>. This means that additional deployment up to 2020/21 will continue to have an impact to 2040/41.

## 7. NPV Estimates

7.1. The table below provides a breakdown of the Net Present Value (NPV) associated with the additional deployment that the policy changes will bring on up to the end of

2020/21, as well as its main components. The components of the NPV calculation are shown in more detail below, including sensitivities and ranges. NPV calculations are based on discounted values cumulative over the policy lifetime.

- 7.2. This NPV is based around our assumed deployment scenario; different deployment levels will generate different NPVs which could further extend the range shown by the sensitivities

Table C7: Central NPV of new RHI deployment projected during this spending review

	Resource Cost	Value of CO <sub>2</sub>		Air Quality Benefits	NPV
		Traded	Non traded		
<b>Interim Deployment (during 16/17)</b>					
Non-Domestic	£-1,536 m	£54 m	£1,714 m	£105 m	£337 m
Domestic	£-37 m	£1 m	£23 m	£12 m	£-1 m
<b>Reformed RHI (17/18 – 20/21)</b>					
Non-Domestic	£-2,779 m	£132 m	£3,473 m	£212 m	£1,039 m
Domestic	£-439 m	£11 m	£276 m	£123 m	£-30 m
<b>Total SR Period</b>	<b>£-4,791 m</b>	<b>£197 m</b>	<b>£5,487 m</b>	<b>£451 m</b>	<b>£1,344 m</b>

## 8. Non-Monetised Costs and benefits

- 8.1. In addition to the monetised costs and benefits above, there are several Non-monetised costs and benefits detailed below:

- Innovation and cost reductions - By supporting renewable heat deployment BEIS expects that costs will reduce and performance may increase over time. Additionally the barriers that customers currently face when thinking about renewable heating such as the risk around unproven technologies and hassle costs will reduce if deployed successfully. These benefits have not been quantified.
- Rebound Effect - For some heat users, installing a low carbon heat technology could lead to an overall lowering of fuel bills. This could lead to an overall increase in energy consumption. This has not been quantified because of the heterogeneity in household responses and the lack of evidence for heating.
- Impacts on Electricity Generation - Some technologies supported within the RHI also support the production of low carbon electricity, specifically solid biomass and biogas Combined Heat and Power. By offering tariff guarantees for some of the largest systems, policy decisions here could also have a marginal impact on the production of low carbon electricity.



**Annex D – Correspondence with the Commission**

Annex	Description	
1	Supplimentary questions from 29th April Question 4 - Outdated table	29.04.2016
2	Supplimentary information 17th June Proposal 1 - Outdated policy position (see Annex 4)	17.06.2016
3	Supplimentary questions from 5th July	05.07.2016
4	Supplimentary information 17th October	17.10.2016
5	Supplimentary questions 17th October	17.10.2016
6	Supplimentary questions 28th October Typo in LCOE (see Annex 7)	28.10.2016
7	Email trail between the Commission and BEIS	17.10.16 - 22.11.16