



EUROPEAN COMMISSION

Brussels, 27.2.2017
C(2017) 1433 final

PUBLIC VERSION

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**Subject: State Aid SA.44622 (2016/N) – United Kingdom
Modification of the Renewable Heat Incentive Scheme**

Sir,

1. PROCEDURE

- (1) Following pre-notification contacts, on 12 December 2016 the United Kingdom notified, pursuant to Article 108(3) of the Treaty on the Functioning of the European Union (TFEU), modifications to the existing Renewable Heat Incentive (RHI) aid scheme for supporting investments in renewable heat technologies.¹ In response to requests from the Commission, the United Kingdom provided additional information on 19 December 2016, and on 18 and 19 January 2017.

2. DESCRIPTION OF THE SCHEME

2.1. Background and objectives of the notified scheme

- (2) The RHI provides financial support to a range of renewable heat technologies in England, Wales and Scotland.² The main objective of the RHI scheme is to encourage the use of renewable resources for heating, thereby reducing the CO₂ emissions from heat, in view of meeting the UK's target under the Renewable

¹ The RHI scheme was originally approved by the Commission on 28 September 2011 (Case SA. 32125), OJ C 341, 9.11.2012, p. 1.

² Northern Ireland operates a separate renewable heat incentive scheme.

The Rt Hon Boris JOHNSON
Secretary of State for Foreign Affairs
Foreign and Commonwealth Office
King Charles Street
London SW1A 2AH
United Kingdom

Energy Directive (2009/28/EC).³ The UK estimates that the support to renewable heat through the notified scheme will avoid 25-38 million tonnes of CO₂ emissions by 2020. The scheme's other objectives include significantly increasing the uptake of renewable heat generation, and developing the low carbon heat market and supply chain.

- (3) The RHI was introduced in November 2011 to the non-domestic sector (businesses, public sector bodies and other organisations) to support space heating, process heating and the production of biomethane for injection into the gas-grid.⁴ A number of changes covering air quality, metering and other minor changes were also declared compatible by the Commission.⁵
- (4) In April 2014, the scheme was extended to the domestic sector to provide financial support for renewable heat technologies to homeowners, private and social landlords and people who build their own homes.⁶
- (5) Further amendments to the non-domestic scheme were introduced in May 2014.⁷
- (6) The notification of 12 December 2016 concerns the following modifications to both the domestic and non-domestic RHI, which are explained further in Section 2.9:
 - a) Under the non-domestic scheme:
 - a single tariff for all biomass plant sizes;
 - amendments to biomass tiers (including biomass cogeneration of heat and power (CHP));
 - introduction of tariff guarantees for large plants;
 - changes to support for shared ground loop systems.
 - b) Under the domestic scheme:
 - introduction of 'assignment of rights' to RHI payments.
- (7) The UK authorities intend to implement these changes on the date the new RHI regulations come into force, except the assignment of rights, which would be introduced at a later date. No aid will be granted before the date of this Commission decision.

³ Directive 2009/28/EC on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC, OJ L 140, 5.6.2009, p. 16.

⁴ Case SA.32125 Renewable Heat Incentive (RHI) scheme, as referred to above.

⁵ Case SA.36345 Renewable Heat Incentive (RHI) scheme — Air quality requirements, decision of 29 April 2013. OJ C 162, 7.6.2013, p. 3.

⁶ Case SA.35766 Extension of the Renewable heat Incentive (RHI) to the domestic sector, decision of 9 December 2013. OJ C 69, 7.3.2014, p. 1.

⁷ Case SA.37562 Amendments of the Renewable Heat Incentive (RHI) scheme for the non-domestic sector. Decision of 19 December 2013. OJ C 117, 16.4.2014, p. 1.

2.2. National legal basis and granting authority

- (8) The national legal basis is Section 100 of the Energy Act 2008⁸, and the RHI Regulations 2011⁹, as amended in 2016.
- (9) The RHI scheme is designed by the UK Department for Business, Energy and Industrial Strategy (BEIS)¹⁰ and is managed by the energy regulator, the Office of Gas and Electricity Markets (Ofgem), which is the granting authority.

2.3. Beneficiaries

- (10) The RHI scheme is open to the owners of eligible renewable heat installations and producers of biomethane injected into the national gas grid. In the non-domestic sector, beneficiaries include industrial, commercial, public sector and not-for-profit organisations. In the domestic scheme, the beneficiaries can be:
- owner-occupiers (those who own their own home, whether it is their primary or secondary residence);
 - private landlords (undertakings who own domestic properties that they rent out);
 - registered social housing providers (social landlords);
 - self-builders.¹¹
- (11) The supported renewable heat technologies and fuel sources¹² are shown below:

Domestic RHI:	Non-domestic RHI:
<ul style="list-style-type: none">• biomass boilers and biomass pellet stoves• air source heat pumps• ground source heat pumps• solar thermal	<ul style="list-style-type: none">• combined heat and power (using renewable fuel sources)• solid biomass (including municipal solid waste)• air source heat pumps• ground source heat pumps (including shared ground loop systems)• solar thermal• deep geothermal• biogas combustion• biomethane injection

- (12) The UK authorities have confirmed that biofuels are not supported by the RHI.
- (13) In the domestic sector, renewable heat installations are only eligible under the RHI, if energy efficiency measures have been put in place.¹³ Domestic renewable heat installations 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 property¹⁴ (this requirement is not applicable to solar thermal

⁸ <http://www.legislation.gov.uk/ukpga/2008/32/part/5/crossheading/renewable-heat-incentives>

⁹ http://www.legislation.gov.uk/ukdsi/2011/9780111512753/pdfs/ukdsi_9780111512753_en.pdf

¹⁰ Previously the Department of Energy and Climate Change.

¹¹ See SA.35766, footnote 3.

¹² All of which fall within the definition of renewable energy sources in Article 2 of the Renewable Energy Directive.

¹³ See SA.35766, recital (14).

¹⁴ 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

installations, which are generally not sufficient to fully heat a property on their own).

- (14) In the non-domestic sector, properties may be heated through a combination of fossil fuel heat and renewable heat. However, the RHI tariff only pays for the renewable element of heat used, and this will be verified through metering.

2.4. Form of aid and level of support

- (15) The RHI provides support in the form of a range of pence/kWh tariffs paid quarterly to useful¹⁵ heat generated from renewable technologies. The tariffs vary by technology and size of the installation. They cover the cost difference between heat generated from renewable technologies and heat generated from fossil fuel sources.
- (16) The UK authorities have explained that tariffs have evolved over time due to (i) new evidence collected during the tariff reviews¹⁶ and consultation period, (ii) changes in the technology cost data and assumptions¹⁷ and (iii) the tariff degression¹⁸ mechanism being triggered.
- (17) The current applicable tariffs are published on the RHI website.¹⁹ The proposed revised tariffs under the reformed RHI as compared to the tariffs at the time of the previous Commission decisions are shown in Annex 1. The new increased tariffs will only apply from the date on which the new RHI regulations come into force, but most new participants who have applied since 14 December 2016 will already be eligible for those tariffs.²⁰ The UK is following this approach to avoid a drop in investments from the announcement of the new tariffs until they start being applicable, as this could risk damaging the supply chain.

is metered and not estimated. Solar thermal, unlike other renewable heat technologies, can generally not meet the total heat requirement of a property.

¹⁵ The scheme supports heat production up to a certain limit so as to not producing heat purely to claim RHI payments.

¹⁶ Following the commitment 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, and a review of the biomethane tariff in 2014/15.

¹⁷ Such as: capital costs of equipment and load factors (for both the renewable and counterfactual technologies), and fuel prices (counterfactual fossil fuel prices and electricity prices faced by heat pumps).

¹⁸ If a certain technology is deploying above forecast levels, and the budget expenditure reaches a certain pre-set level (or "trigger"), new projects admitted to the scheme will receive a reduced tariff. This ensures that support is given to a mix of technologies, and that no single technology is being overcompensated.

¹⁹ Non-domestic tariffs: <https://www.ofgem.gov.uk/environmental-programmes/non-domestic-rhi/contacts-guidance-and-resources/tariffs-and-payments-non-domestic-rhi> Last accessed 24 January 2017.
Domestic tariffs: <https://www.ofgem.gov.uk/environmental-programmes/domestic-rhi/contacts-guidance-and-resources/tariffs-and-payments-domestic-rhi/current-future-tariffs> Last accessed 24 January 2017.

²⁰ Date when the Government response to the consultation on changes to the RHI was published: <https://www.ofgem.gov.uk/publications-and-updates/government-consultation-response-changes-rhi> Last accessed 24 January 2017. For small and medium biomass boilers, the changes will only apply to those systems that accredit to the RHI on or after the date the regulations come into force. New biogas and biomethane will be given the choice of tariffs, since the new higher tariffs also bring additional requirements.

- (18) Once an installation is accredited, a tariff level is assigned for the rest of its lifetime. The tariff is adjusted each year based on the Consumer Price Index²¹ to take inflation into account.
- (19) The target market for domestic RHI remains homes in off-gas grid areas which are currently being heated through oil or electric heating options, which are more expensive than gas. These properties typically face higher energy bills and energy price uncertainty, and are also generally more carbon intensive. The tariffs have been determined using an oil boiler as the counterfactual.
- (20) The principles for tariff setting under non-domestic RHI remain the same as in the previous versions of the RHI scheme assessed by the Commission, except for the notified amendments. The main departure is that instead of creating a supply curve and picking the median installation, the UK authorities choose the typical reference installation, and the tariff is based on the costs and benefits of a low carbon technology in that property. The counterfactual varies depending on the technology, and is generally a large oil and gas boiler. For biomethane and biogas, the counterfactual is the equivalent gas injected into the gas grid. The counterfactual technologies are listed in Annex 2.
- (21) The biomass-CHP tariff is higher than the tariff for large biomass heat-only plants. This reflects the higher capital costs and the additional efficiency benefits biomass-CHP can deliver, compared to the separate generation of power and heat.
- (22) In August 2016 the UK Government introduced a power efficiency requirement in the non-domestic scheme for new biomass-CHP plants. Plants with a power efficiency of 20% or above are eligible to receive the biomass-CHP tariff for all their heat. Plants with a power efficiency of below 20% will receive the biomass-CHP tariff for a proportion of their heat, with the remainder eligible for the relevant biomass heat-only tariff. These changes were made to ensure that plants producing only a relatively small amount of power were not overcompensated and that payments represented value for money.
- (23) The target **rates of return** for all technologies remain 12% for the non-domestic sector and 7.5% for the domestic sector, as in the current scheme. These rates were determined based on analysis by consultants and feedback from stakeholders.
- (24) RHI payments are determined by multiplying the relevant tariff with the beneficiary's heat load in kWh/year. In the domestic sector, this is the deemed heat load of the property set out in its Energy Performance Certificate.²² By contrast, the heat load of non-domestic installations is generally metered, except under the proposal for shared ground loop systems, where the owner of the system would receive RHI payments based on the deemed heat demand of the individual properties (see Section 2.9.1.4).
- (25) Support can also be provided to domestic beneficiaries to install Metering and Monitoring Service Packages (MMSP) for heat pumps and biomass boilers on a

²¹ The RHI tariffs were indexed so far to the Retail Prices Index. The Consumer Price Index is now the official measure of inflation of consumer prices in the United Kingdom and will apply to tariffs from 1 April 2017.

²² See SA.35766, recital 15, which explains the exceptions to this general rule.

voluntary basis.²³²⁴ In contrast to the flat rate per year paid currently, under the notified revised scheme the UK intends to grant 50 % of the compensation upon installation and the remaining 50 % over the remaining payment lifetime, to encourage the update of these voluntary monitoring systems. Other conditions remain unchanged.

2.5. Duration of the support

- (26) The UK Government intends to keep the RHI open to new applicants until at least 2020/2021.²⁵ This means that the last RHI payment will be made in 2040/2041.
- (27) The operational lifetime of renewable heat installations is approximately 20 years. For each beneficiary, payments are guaranteed for the same duration as in previous versions of the scheme (20 years in the non-domestic sector and 7 years in the domestic sector), provided they continue to satisfy the eligibility criteria and ongoing obligations. The UK explained that in the domestic scheme, the majority of costs are normally incurred during installation. Consumer loans, finance or purchase agreements have a similar duration. Also, this is the average length of time that people in the UK remain in a property. This timescale also makes it more affordable to the public budget.

2.6. Comparison of features of domestic and non-domestic schemes

- (28) The table below summarises the differences between the domestic and non-domestic schemes:

Property	Domestic Scheme	Non-Domestic
Period payable	7 years	20 years
Rate of return on additional investment	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 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 levels for heat pumps and design standards), Combined heat and power quality assurance for combined heat and power systems Sustainability requirements for biomass, biogas and biomethane installations. requirements for biomass, biogas and biomethane installations. Metering standards

Source: UK authorities.

²³ The MMSP are an advanced set of meters fitted by the installer to the new heating system, that allow the householder and installer to view measured data about the performance of their system over the internet, and the government to gather aggregate evidence on performance.

²⁴ See SA.35766, recitals (16) and (17).

²⁵ Unless the scheme budget cap is triggered. The UK Government has not set out its intended level of spend on the RHI beyond 2020/2021.

2.7. Budget and financing

- (29) The RHI continues to be funded through the State budget.
- (30) The RHI scheme has so far been subject to scheduled or early reviews and tariff degressions. The latest spending review increased the budget of the scheme. The table below sets out the anticipated annual expenditure for the amended scheme, and its comparison with the existing scheme.

Nominal expenditure in year (£m)	2016/17	2017/18	2018/19	2019/20	2020/21
Total new expenditure	£74m	£188m	£307m	£411m	£518m
Existing scheme	£522m	£534m	£550m	£568m	£585m
Total RHI	£596m	£722m	£857m	£979m	£1 103m

Source: UK authorities

- (31) In the revised scheme for 2016-2021, tariff degressions will continue to be the primary mechanism for keeping expenditure within budget. In addition, the UK authorities have added budget caps to prevent further commitments if there is a risk of the budget being exceeded:
- a 'budget cap' to ensure that the scheme as a whole does not overspend;
 - a 'value for money' cap, which is an upper limit on tariffs;
 - a 'heat demand cap', which is a cap per property and per year applicable to domestic payments to control potential over-compensation.

2.8. Cumulation

- (32) RHI tariffs cannot be cumulated with any other State aid for the same costs.
- (33) Under the non-domestic scheme, tariffs cannot be cumulated with investment aid. Only CHP technologies can still be supported by more than one incentive scheme because they can generate both renewable heat and electricity.
- (34) In the domestic scheme, the RHI does not interact with any other State aid.
- (35) Potential RHI beneficiaries are asked to provide information on other forms of funding. RHI support will only be available if the renewable heat installation in question has not received (and will not receive) any other State aid for the same costs. Any other State aid received will be deducted from RHI payments.

2.9. Scope of the notified changes

2.9.1. Amendments to non-domestic RHI

- (36) The UK Government has notified several amendments to the non-domestic RHI. Most of them, and in particular the single tariff and the revised tiering for biomass systems, are aimed at encouraging larger, more cost-effective biomass plants. The UK authorities argue that large systems can offer economies of scale and the best value for money, which could remove the need to grant these systems subsidies in the longer term.

2.9.1.1. Single tariff for all biomass plant sizes

- (37) Current tariffs for biomass distinguish between installations of different sizes. The UK intends to remove this distinction and introduce a single biomass tariff for all sizes of system. The UK authorities explained that the current RHI has primarily resulted in the deployment of small and medium installations. It has been less successful in encouraging the deployment of large installations (above 1 MW) and this despite the tariffs increasing in 2013.

2.9.1.2. Amendments to biomass tiers

- (38) Under the current RHI tariff for non-domestic biomass, small and medium size plants can run at full capacity for 15% of the hours in a year, before moving from the ‘Tier 1’ tariff to a lower ‘Tier 2’ tariff for any further generation in that year. Large plants receive the same tariff independently of how many hours/year they work. The UK intends to increase the Tier 1 threshold up to 35% load factor and apply it for all plants. Low load factor large biomass will receive a higher tariff than currently, while medium biomass systems will receive a lower tariff. Given the higher tariffs that would be required for smaller facilities²⁶, there are also incentives for small plants to be cost-efficient or to run at higher heat load factors (above 35%).

Technology	Current tariff £p/kWh (Jan 17) (tariff changes at 15% load factor)	Proposed tariff £p/kWh (tariff changes at 35% load factor)
Small biomass (up to 200kW)	Tier 1: 2.95p, Tier 2: 0.78p	Tier 1: 2.91p Tier 2: 2.05p
Medium biomass (200kW – 1MW)	Tier 1: 5.24p, Tier 2: 2.27p	
Large biomass (1MW and above)	2.05p	

Source: Ofgem website²⁷ and notification

- (39) The UK authorities clarified that the current tier threshold is within the range of a reasonable minimum level of usage of a biomass installation used for space heating (15%). The new threshold (35%) is set above the level at which the UK authorities data show that most plants will operate. This means that the increase of the threshold will not have an impact on the expected returns available to most systems, but could act as a back stop for overcompensation in larger plants.

2.9.1.3. Introduction of tariff guarantees for large plants

- (40) The UK intends to introduce guaranteed tariffs for large plants at an early stage of the application process. The aim is to encourage highly engineered projects with typically longer lead times to come forward by providing them with certainty on the tariffs they will receive once the project is commissioned. The following technologies will benefit from guaranteed tariffs:

²⁶ According to the analysis done by the UK, the tier 1 tariff is set below the central estimate marginal cost of fuel (around 4p/kWh). Smaller plants lack economies of scale and have larger comparable fixed costs per kW.

²⁷ <https://www.ofgem.gov.uk/environmental-programmes/non-domestic-rhi/contacts-guidance-and-resources/tariffs-and-payments-non-domestic-rhi> last accessed on 10 January 2017.

- large biomass boilers (above 1 MW in capacity);
 - large biogas plant (above 600 kWth);
 - GSHPs (above 100 kW including shared ground loop systems with a total installed capacity above 100 kW);
 - all capacities of biomethane, biomass-CHP and deep geothermal plant.
- (41) The government will limit the amount of heat that will be covered by a single tariff guarantee to 250 GWh per year. Any heat produced above this limit will be eligible for the prevailing tariff at the moment of being accredited to the scheme.

2.9.1.4. Introducing deemed metering for shared ground loops for domestic properties

- (42) Heat networks that have separate heat pumps in multiple domestic dwellings with a shared ground loop are only eligible under the non-domestic RHI scheme. Landlords currently receive support on the basis of the actual metered heat. The UK intends to allow shared ground loop systems for residential properties in the non-domestic RHI to use deemed (not metered) heat demand, as in the domestic scheme. The property will need to comply with the same energy efficiency improvements required under the domestic scheme. The payments will be limited by applying heat demand limits.
- (43) According to the UK authorities, shared ground loop systems have significant potential for the rollout of ground source heat pumps. Stakeholders consulted by the UK authorities suggested that the additional costs and administrative burden linked to the metering requirements, and uncertainty regarding RHI payments are barriers to the deployment of ground source heat pumps. By allowing shared group systems to receive support on the basis of deemed heat demand, instead of metered heat, the UK authorities intend to provide more certainty on the payments to landlords.
- (44) The UK authorities anticipate 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.
- (45) The deeming method mirrors the methodology agreed by the Commission for the domestic RHI scheme.²⁸ To prevent overcompensation in cases where the dwellings are unoccupied and thus not heated, the UK authorities will ask applicants to declare their occupancy. If there is information that suggests that the property may be under-occupied,²⁹ but this isn't declared, the UK authorities can ask for further evidence to verify this. Occupancy would also be checked during compliance audits.³⁰ The UK explains that these processes have been used for the domestic RHI and have been working effectively.

²⁸ SA.35766, recital (15).

²⁹ Occupied for less than 183 days during a year (half of the year). This is the same definition as for the domestic RHI.

³⁰ These are desk or on-site audits carried out by Ofgem to assess whether the information provided by the applications relating to their installation is correct. Audits can be random or targeted (to address a

2.9.2. *Amendment to domestic RHI: Introducing assignment of rights*

- (46) The UK intends to allow householders the choice to assign their RHI payments to a registered third party who has financed some or all of the installation. Domestic beneficiaries will be free to choose to which registered financier they wish to assign their right RHI payments. 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), to ensure consumers are appropriately protected.
- (47) A call for evidence made by the UK Government in 2015 showed that the cost of renewable heat installations was a barrier to effective take-up and that the introduction of third party financing would help overcome that barrier. By introducing the assignment of rights, the government aims to help those less able to pay the cost of a renewable heat installation to access credit.
- (48) The homeowner will be the owner of the renewable heat installation and also own or occupy the property that it is in, and consequently have the right to RHI payments if accredited onto the scheme. Once the plant is installed and commissioned, the homeowner would complete the application form and confirm whether they will assign their right to RHI payments (as the owner of the plant) to the third party.
- (49) The UK has explained that heat installations with payment rights assigned to a third party will be treated equally to other comparable installations under the scheme (they will not have any different eligibility, compensation parameters or tariffs). The UK does not consider that finance providers will be overcompensated 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, such as the cost of capital, the risk of compliance by the consumer and his/her heat use.

2.10. Evaluation of the scheme

- (50) The UK authorities have notified an evaluation plan for the scheme. The main elements of the evaluation plan are described below.
- (51) The evaluation plan notified by the UK authorities has 12 evaluation questions in order to assess whether the scheme achieved its intended outcomes; whether the scheme's design and implementation was the most appropriate one; whether the aid was proportionate or cost-effective; and the extent to which the scheme impacted on competition and trade.
- (52) The direct effects of the scheme will be evaluated by monitoring the number of renewable heating system installations, the kWh of renewable heat generated and

specific risk identified within the scheme). Each year, around 200 audits are carried out in the non-domestic scheme and around 600 in the domestic scheme.

the CO₂ abated.³¹ Specific questions will consider the scheme's impact on the installation of prioritised technologies (air and ground source heat pumps³²) and vis-à-vis lower income households. The evaluation will take into account the participation of beneficiaries in other energy related schemes (e.g. EU Emissions Trading Scheme) to isolate the influence of the reformed RHI in the outcomes achieved.

- (53) The appropriateness of the scheme's design and implementation will be evaluated by considering potentially different impacts by categories of beneficiaries, depending on their different contexts. Furthermore, the evaluation will also look at potential unintended consequences and outcomes of the scheme related to its delivery mode.
- (54) The proportionality or cost-effectiveness of the aid will be evaluated by calculating the cost per kWh of renewable energy generated and per tonne of CO₂ abated and by assessing the effects of the budget cap and degression mechanisms for the different beneficiaries. Risks of overcompensation or under compensation will also be evaluated.
- (55) Potential impacts on competition and trade will be evaluated by considering indirect impacts on the competitiveness of beneficiaries and whether distortions of trade for renewable heat technologies or for biomass fuels and biomethane feedstocks can be observed.
- (56) In parallel to the main evaluation, there will be an annual review of the assumptions for the tariff setting calculations. This review will identify whether the assumed rates of return fall within the boundaries set in the State aid notifications. It should be noted that the findings of this approach should be treated as indicative only, and not conclusive.
- (57) A feasibility study, supported by an independent evaluation expert, has been undertaken to define the most appropriate methods to develop the evaluation questions. The feasibility study found that a causal impact evaluation method is appropriate for the evaluation questions on the scheme's achievements, whereas other evaluation approaches are preferable for the other questions. In particular, the predecessor scheme's beneficiaries are considered the most suitable counterfactual. The comparison between the beneficiaries of the reformed and of the previous schemes is expected to control for unobservable variables related to beneficiary differences, including environmental attitudes, access to financial capital and investment risk attitudes. The use of a 'regression discontinuity' approach around the time at which the reformed scheme is implemented is expected to control for wider economic and technology-related factors. The evaluation plan includes a detailed description of this approach and of those that will be used to answer the remaining evaluation questions.
- (58) In order to perform the evaluation, the UK authorities have committed to make available a range of data sources, both scheme-specific ones and secondary ones

³¹ The CO₂ abatement is calculated on a lifetime basis, as an estimate of the difference between the emissions from the renewable heat technology and the emissions from the counterfactual technology which it replaced.

³² The UK authorities consider that air and ground source heat pumps are likely to be strategically important in the long term decarbonisation of heat.

such as the Inter-departmental Business Register and the Energy Efficiency Performance register. The authorities will also conduct surveys and interviews with beneficiaries and non-beneficiaries.

- (59) The UK authorities have committed to submit the evaluation report to the Commission by October 2020 (6 months before the end of the scheme). An interim report, providing insights on the performance of the scheme, is expected to be sent to the Commission in January 2018.
- (60) The evaluation will be conducted by an external independent evaluator to be selected through an open tender procedure. The UK authorities have committed to consider the relevant skills and experience of the tender applicants, particularly in the field of quantitative evaluation methods.
- (61) The evaluation report will be published on the gov.uk website. According to the UK authorities, the evaluation results will make it possible to review whether an incentive-based policy is relevant and sustainable. Furthermore, the evaluation will provide valuable evidence throughout the scheme to inform strategic decisions and policy development.

3. ASSESSMENT

3.1. Presence of State aid

- (62) Article 107(1) TFEU states that *‘any aid granted by a Member State or through State resources in any form whatsoever which distorts or threatens to distort competition by favouring certain undertakings or the production of certain goods, shall, in so far as it affects trade between Member States, be incompatible with the common market’*.
- (63) The support for renewable heat technologies under the RHI is funded from the general State budget and therefore it is granted by the State and it involves State resources. The measure is selective, since it only applies to certain technologies for heat production, as opposed to conventional or other renewable heat production technologies. The advantage provided by the tariffs would normally not be available under normal market conditions. As the beneficiaries include undertakings involved in intra-EU operations, it threatens to distort competition and affect trade between Member States.
- (64) As regards payments to householders that have assigned their rights to a third party, the Commission considers that the beneficiary of support would remain the householder (the owner of the installation), since he or she is the one who applies for the aid, and has a choice of transferring the right to receive payments to a third party who has contributed to financing the installation.
- (65) The notified amendments therefore do not alter the conclusion reached by the Commission in its previous decisions that the scheme constitutes State aid within the meaning of Article 107(1) TFEU, as it applies to the non-domestic sector. In the

domestic sector, support can be considered aid to the extent it is provided to landlords.³³

3.2. Requirement for a detailed assessment of individual projects

- (66) Section 2, paragraph 20(b) 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 250 MW (unless granted on the basis of a competitive bidding process).
- (67) The UK authorities do not expect any plants with an electrical capacity of 250 MW or over to seek support on the RHI. If such plants do come forward, the UK has committed to comply with the requirement to undertake a detailed assessment and make an assessment of additional conditions for individually notifiable aid under Common Assessment Principles. The Commission reminds the UK that such individual aid will need to be notified and authorised by the Commission before it is granted.

3.3. Legality of the aid

- (68) The existing RHI scheme was approved by the Commission as compatible aid in the abovementioned decisions.³⁴ The modifications notified here have not yet come into effect. The UK has therefore fulfilled its obligation under Article 108(3) TFEU.

3.4. Compatibility of the aid

- (69) The Commission has assessed the compatibility of the notified aid scheme on the basis of Article 107(3)(c) TFEU.
- (70) The original RHI scheme and subsequent notified amendments were approved and deemed compatible with the former Guidelines on State aid for Environmental Protection (2008).³⁵ The notified modifications aim at promoting the generation of electricity from renewable sources and therefore fall within the scope of the currently applicable Guidelines on State aid for environmental protection and energy 2014-2020 (EEAG).³⁶ In accordance with Section 5 (paragraph 250) of the EEAG, the full scheme also needs to be assessed under the EEAG, given that the proposed changes are notifiable according to Article 1(c) of Regulation (EU) 2015/1589.³⁷
- (71) The Commission has assessed the scheme on the basis of the general compatibility provisions in Section 3.2 and the specific compatibility criteria for aid to energy

³³ See section 3.1 in decision on case SA. 35766. Landlords qualify as undertakings in the meaning of Article 107 (1) TFEU, contrary to individual householders.

³⁴ See recitals (2) to (5).

³⁵ Community Guidelines on State Aid for Environmental Protection, OJ C 82, 1.4.2008, p. 1.

³⁶ Communication from the Commission — Guidelines on State aid for environmental protection and energy 2014-2020, OJ C 200, 28.6.2014, p. 1-55.

³⁷ Council Regulation (EU) 2015/1589 of 13 July 2015 laying down detailed rules for the application of Article 108 of the Treaty on the Functioning of the European Union (codification). OJ L 248/9 of 24.9.2015.

from renewable sources in Section 3.3, in particular operating aid for energy from renewable sources other than electricity in Section 3.3.2.2. of the EEAG.

3.4.1. Objective of common interest

- (72) The objectives of the RHI remain unchanged. As explained in recital (2), the primary objective is to contribute to meeting the UK target under the Renewable Energy Directive, to increase the uptake of renewable generation and to develop the renewable heat market and supply chain.
- (73) The Commission considers that the notified changes do not alter its previous assessment and it considered that the RHI scheme is aimed at an objective of common interest in accordance with Article 107(3)(c) TFEU.

3.4.2. Need for State aid and appropriate instrument

- (74) According to paragraph 115 of the EEAG, the Commission presumes the existence of a residual market failure which can render State aid necessary to encourage investments in renewable energy.
- (75) According to paragraph 107 of the EEAG, under certain conditions State aid can be an appropriate instrument to contribute to the achievement of the EU objectives and related national targets.
- (76) Paragraph 116 of the EEAG states that, to allow Member States to achieve their targets in line with the EU 2020 objectives, the Commission presumes the appropriateness of aid provided all other conditions are met.
- (77) The presence of a market failure which demonstrates the need for state intervention in the renewable heat sector in the UK remains since previous assessments of the RHI scheme. The UK authorities explain that renewable heat technologies are currently not able to compete financially with fossil fuel alternatives. If the market failure (externalities stemming from different energy systems not being valued by the market) is not addressed, it could prevent the UK from meeting its 2020 legally binding renewable energy target. According to the UK authorities, contributions from renewable energy in 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. The UK authorities expect that by supporting consumers, the RHI scheme will increase competition with conventional heating options and drive down the cost of renewable heat equipment and its installation, thereby supporting green jobs and developing skills to install and maintain equipment.
- (78) Financial support is given in the form of a pence/kWh tariff, which depends on the technology used. The UK argues that a tariff-based scheme spread over a number of years reduces the impact on the State budget, as opposed to upfront investment grants. Tariffs also make it possible to link payments to heat production (in the non-domestic scheme, thanks to metering, payments will stop if renewable heat production stops). Subsidies paid in instalments can also encourage beneficiaries to maintain their equipment.
- (79) On the domestic scheme, where a deeming calculation is used to estimate heat demand, an annual statement is required confirming that the equipment continues to meet the eligibility criteria and the beneficiary is complying with its responsibilities.

Requiring beneficiaries to front the capital cost of equipment ensures that the beneficiary has a stake in keeping the equipment in good working order. It also helps reducing the impact on the distortion of competition, as benefits are only realised over a substantial period of time.

- (80) In view of the above, the Commission considers that the aid is necessary and that the RHI scheme (as amended by the notified changes) remains an appropriate instrument to address the objective of common interest.

3.4.3. *Incentive effect*

- (81) In line with paragraph 49 of the EEAG, the incentive effect occurs if the aid induces the beneficiary to change its behaviour towards reaching the objective of common interest which it would not do without the aid. According to paragraph 50, the incentive effect is not present if work on the project started before the beneficiary submitted his/her application for aid. The application form should contain the elements listed in paragraph 51.
- (82) The UK authorities explain that, before the introduction of the RHI, the UK market for these technologies was very immature. By the end of July 2016, 15 093 installations had been accredited in the non-domestic scheme, and 50 394 in the domestic scheme, providing estimated carbon savings in 2015/16 of just over two million tonnes of CO₂ emissions. Research commissioned by BEIS³⁸ shows that being able to claim the RHI was the single main reason for choosing a renewable technology mentioned by most applicants in the domestic scheme.³⁹ The RHI tariff influenced the technology choice of 72 % of the applicants. 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; the income available from the RHI is the main motivation for 43 % of respondents.⁴⁰
- (83) The RHI requires applicants to have purchased, installed and commissioned eligible renewable heating technologies before applying for aid. Applicants must comply with various clear and published eligibility criteria in order to be given support. 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, because they 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. Furthermore, RHI tariffs are set to compensate the difference between renewable technologies and the fossil fuel counterfactual, therefore the UK authorities assume that applicants would not invest in renewable energies without support, as they are more expensive.

³⁸ Undertaken by NatCen Social Research, Centre for Sustainable Economics, Eunomia Research and Consulting and Frontier Economic.

³⁹ In addition, 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.

⁴⁰ For RHI applicants, environmental factors do not appear to be a major trigger for the installation of a new heating system.

- (84) The UK authorities have confirmed that the RHI application forms are being amended so that they comply with paragraph 51 of the Guidelines. In accordance with the same paragraph, once an application is filed, Ofgem determines whether a potential individual beneficiary is eligible for RHI support. If an applicant meets all the requirements in the RHI Regulations, Ofgem has no discretion to reject their application. In the previous RHI decisions the Commission agreed that, when the investments in renewable heating installations were motivated by the promise of support and would have not been performed in the absence of such a promise, the aid kept its incentive effect. The Commission considers that applicants who install renewable heat technologies have an incentive to choose such technologies on the assumption that they would be eligible for the scheme, once the eligibility criteria are met.
- (85) The Commission therefore accepts the arguments provided by the UK and sees no reason to deviate from its assessment in the Commission's previous decisions that the aid granted under the RHI scheme (as amended by the notified changes) has an incentive effect.

3.4.4. Proportionality

- (86) According to paragraph 69 of the EEAG, environmental aid is considered to be proportionate, if the aid amount per beneficiary is limited to the minimum needed to achieve the environmental protection objective aimed for.
- (87) Section 3.2.5.2 of the EEAG stipulates that aid may be cumulated so long as the total amount of State aid for an activity or project does not exceed the limits laid down in the guidelines.
- (88) Paragraph 131 of the EEAG specifies four cumulative conditions that operating aid for energy from heat needs to meet to be considered compatible with the internal market:
- (a) the aid per unit of energy does not exceed the difference between the total levelised costs of producing energy ('LCOE') from the particular technology in question and the market price of the form of energy concerned;*
- (89) As in its previous decisions on the scheme, the Commission agrees 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. Therefore, the relevant comparison is between the renewable and conventional heat production prices.
- (90) Tariffs are calculated to cover the cost difference between heat generated from renewable technologies and heat generated from fossil fuels (the fossil fuel counterfactual). For biogas and biomethane, the counterfactual is the gas that would have been injected to the gas grid.
- (91) The UK authorities have provided a comparison between the LCOE of RHI renewable heating technologies and the counterfactual technologies (see Annex 2 to this decision). The UK authorities have also provided information on the calculation of the LCOE data, and approximations for technologies where it is not possible to calculate the LCOE.

- (92) The Commission has assessed the data and information provided by the UK, and notes that the aid per unit of energy does not exceed the difference between the LCOE of the technologies supported and the cost of the counterfactual.

(b) the LCOE may include a normal return on capital. Investment aid is deducted from the total investment amount in calculating the LCOE;

- (93) The Commission notes that the target rates of return are maintained at 12% for the non-domestic sector and 7.5% for the domestic sector. According to the UK authorities, these rates have been determined based on analysis by consultants and feedback from a wide range of stakeholders.

- (94) The Commission notes that no investment aid can be cumulated with the operational aid, and that no aid is allowed to compensate for the same eligible costs, as explained in Section 2.8.

- (95) The Commission considers that there is no reason to deviate from its previous views that the rates are reasonable, based on the information and explanations provided by the UK.

(c) the production costs are updated regularly, at least every year

- (96) The applicable tariffs are published on the Ofgem website⁴¹ and are reviewed as referred to above in recital (17). The UK authorities have explained that BEIS collects internal evidence regularly from applications, or anonymised data from consumers, and carries out audits throughout the year. In addition, it undertakes consultations to gather external evidence when required to make changes to the tariffs or their structures. BEIS also regularly monitors markets through market intelligence gathering and through monthly cost control reviews, which include assessing the latest deployment figures. This makes it possible to identify changes in the markets early on. These changes can then be investigated further through a closer analysis of the sector concerned.

(d) aid is only granted until the plant has been fully depreciated according to normal accounting rules in order to avoid that operating aid based on LCOE exceeds the depreciation of the investment.

- (97) The Commission notes that payments are still limited to 20 years (in the non-domestic scheme). This is the expected lifetime of the supported installations, according to the evidence gathered by the UK.

- (98) Based on the above, the Commission considers that the aid granted under the notified measure is proportionate.

3.4.5. Avoidance of undue negative effects on competition and trade

- (99) According to paragraph 90 of the EEAG, the Commission considers that although aid for environmental purposes will tend to favour environmentally friendly technologies at the expense of other more polluting ones, the effect of the aid will in principle not be viewed as an undue distortion of competition, since it is inherently

⁴¹ See footnote 19.

linked to its objective of making the economy greener. The Commission must take into account the overall environmental effect of the measure in relation to its negative impact on the market position and profits of non-aided firms.

- (100) As explained by the UK authorities, RHI tariffs aim to compensate for the additional costs of the renewable heat equipment and for the higher risks and uncertainties associated with its use. Therefore, RHI support is not expected to impact on the competitiveness of firms under the non-domestic RHI relative to other firms that operate in the same market and choose to generate heat using fossil fuels.
- (101) Thanks to the support provided under the RHI, firms operating in the renewable heat sector (manufacturers, installers and providers of maintenance) will improve their market position relative to the counterfactual of no renewables support. The UK expects that support will help develop a very immature market, promoting economies of scale and technological advance, which will drive manufacturing and supply chain costs downwards in the long term. The Commission considers that this is a positive development justified by the scheme's environmental objective.
- (102) The United Kingdom has confirmed that it respects the waste hierarchy, as set out in Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives⁴² (Waste Framework Directive), with regard to support provided under the notified scheme to installations using waste. The UK authorities have explained the steps they are taking to ensure that support for heat from biomass and food wastes do not result in overcompensation, and to avoid wastes being diverted away from recycling or re-use options towards energy use. For example, solid biomass contained in municipal waste used in biomass CHP systems is not eligible for the biomass CHP tariff, to take account of the fact that waste biomass is likely to be cheaper than non-waste feedstocks.
- (103) As regards biogas and biomethane, the UK authorities explained that to limit the use of food crops for anaerobic digestion, new participants who are producing biogas from anaerobic digestion must produce at least 50% of their biogas from waste or residue in order for all the biogas produced or biomethane injected that year to be eligible for subsidy support. Where the amount of biogas produced from feedstocks that are not wastes or residues is in excess of 50% of the total biogas production, this excess will not be eligible for support.
- (104) The Commission finds this approach in line with paragraph 118 of the EEAG regarding the respect of the waste hierarchy.
- (105) Paragraph 116 of the EEAG states that, to allow Member States to achieve their targets in line with the EU 2020 objectives, the Commission presumes that the aid has limited distortive effects, provided all other conditions are met.
- (106) In view of the above, the Commission considers that the measure will not have undue distortive effects on competition and trade and that the overall balance is positive.

⁴² OJ L 312, 22.11.2008, p. 3

3.4.6. *Transparency*

- (107) According to paragraph 104 of the EEAG, Member States must ensure the transparency of aid granted by publishing information regarding the legal basis of the measure and the individual aid awards (beneficiaries, amounts and granting dates, etc.) on a comprehensive State aid website. In line with paragraph 106 of the EEAG, Member States must comply with this obligation as of 1 July 2016.
- (108) The UK already publishes information on the RHI online, and has committed to comply with the transparency requirements in paragraphs 104 to 106 of the EEAG.

3.4.7. *Evaluation, Reporting and Monitoring*

- (109) The EEAG (paragraph 28 and Chapter 4) state that the Commission may require that certain aid schemes are subject to an evaluation, where the potential distortion of competition is particularly high, that is to say when the measure may risk significantly restricting or distorting competition, if their implementation is not reviewed in due time. Given its objectives, evaluation only applies for aid schemes with large aid budgets, containing novel characteristics or when significant market, technology or regulatory changes are foreseen.
- (110) The present scheme fulfils the criteria of being a scheme with a large aid budget and containing novel characteristics; therefore, it will be subject to an evaluation.
- (111) The scope of and evaluation techniques have been defined, taking into account the Commission Staff Working Document on the Common methodology for State aid evaluation,⁴³ in an evaluation plan that the UK authorities have notified together with the aid scheme and whose main elements are described in Section 2.9 above.
- (112) The Commission considers that the notified evaluation plan contains the necessary elements: the objectives of the aid scheme to be evaluated, the evaluation questions, the result indicators, the envisaged methodology to conduct the evaluation, the data collection requirements, the proposed timing of the evaluation, including the date of submission of the final evaluation report, the description of the independent body conducting the evaluation or the criteria that will be used to select the independent body, and arrangements for ensuring the evaluation is publicised.
- (113) The Commission notes that the scope of the evaluation is defined in an appropriate way. It comprises a list of evaluation questions with matched result indicators. Data sources are individually defined for each question. Moreover, the evaluation plan sets out and explains the main methods that will be used in order to identify the impacts of the scheme, and discusses why these methods are likely to be appropriate for the scheme in question.
- (114) The Commission acknowledges the commitments made by the UK authorities that the evaluation will be conducted according to the notified evaluation plan by an independent evaluation body. The procedures envisaged for selecting this evaluation body are appropriate in terms of independence and skills. Moreover, the proposed arrangements for publishing the evaluation results are adequate to ensure transparency.

⁴³ SWD (2014) 179 final.

- (115) Finally, the Commission notes the commitment made by the UK authorities to submit the final evaluation report at the latest by October 2020.
- (116) The Commission also notes that the UK authorities have committed to complying with the annual reporting and monitoring obligations laid down in Section 6, paragraphs 252 and 253 of the EEAG.

3.4.8. Conclusion with regard to the compatibility of the measure

- (117) In light of the above assessment, the Commission considers that the notified aid scheme is an appropriate instrument, necessary to pursue an objective of common interest, and that the notified changes to the RHI scheme do not alter the Commission's previous compatibility assessment: the aid is therefore compatible with the internal market pursuant to Article 107(3)(c) TFEU.

4. CONCLUSION

- (118) The Commission considers the State aid awarded through the RHI compatible with the internal market pursuant to Article 107(3)(c) TFEU.
- (119) The Commission reminds the UK that the evaluation report must be submitted in October 2020 at the latest.
- (120) If this letter contains confidential information which should not be disclosed to third parties, please inform the Commission within fifteen working days of the date of receipt. If the Commission does not receive a reasoned request by that deadline, you will be deemed to agree to the disclosure to third parties and to the publication of the full text of the letter in the authentic language on the Internet site: <http://ec.europa.eu/competition/elojade/isef/index.cfm>.

Your request should be sent to:

European Commission
Directorate-General for Competition
State Aid Registry
1049 Bruxelles/Brussel
BELGIUM
Fax no: + 32 2 296 12 42
stateaidgreffe@ec.europa.eu

Yours faithfully,
For the Commission

Margrethe VESTAGER
Member of the Commission

ANNEX 1: NEW TARIFFS UNDER THE RHI REFORM AND COMPARISON WITH ORIGINAL TARIFFS INCLUDED IN THE PREVIOUS COMMISSION DECISIONS

Non-Domestic Technology	Reform tariff (£p/kWh)		Non-Domestic Technology	Original Tariffs (£p/kWh)	
Solid biomass boilers	Tier one (35%): 2.91 Tier two: 2.05		Biomass ² : solid biomass, municipal solid waste, including cogeneration	Small: < 200 kW	Tier 1: 7.6 Tier 2: 1.9
				Medium: 200-1000kW	Tier 1: 4.7 Tier 2: 1.9
				Large: ≥ 1000 kW	1
Solid biomass cogeneration (CHP)	4.22		Commercial and industrial waste (same tariff as large biomass ³)	2.0	
			Biomass and bio-liquid CHP ³	4.1	
Ground/Water source heat pumps	Tier one: 8.95	5.35	Ground-source ² : water-source and ground -source heat pumps, deep geothermal	Small: < 100 kW	4.3
	Tier two: 2.67			Large: ≥ 100 kW	3.0
Air source heat pumps	2.57		Air to water heat pumps ³	2.5	
Deep geothermal	5.14		Deep geothermal (including deep geothermal CHP) ³	5	
Solar thermal	10.28		Solar thermal ²	< 200 kW	8.5
Biomethane injection	Tier one (first 40 000 MWh of eligible biomethane):	5.35	Biogas production ² : biomethane injection and biogas combustion, except from landfill gas	Biomethane: all sizes; biogas combustion: < 200 kW	6.5
	Tier two (first 40 000 MWh of eligible biomethane):	3.14			
	Tier three (remaining eligible biomethane):	2.42			
Biogas combustion	Small < 200 kW	4.43	Biogas combustion over 200kW ³	Medium: 200-500kW	5.9
	Medium ≥ 200-600kW	3.47		Large: >500kW	2.2
	Large ≥ 600kW	1.30			
Domestic Technology	Reform tariff (£p/kWh)¹		Original Tariff⁴ (£p/kWh)		
Biomass boilers	6.44		12.2		
Air source heat pumps	10.02		7.3		
Ground source heat pumps	19.55		18.8		
Solar thermal	19.74		19.2		

¹These tariffs are offered up to the level that heat demand limits takes place.

Source: UK authorities. ²Tariff mentioned in the Commission decision of 28.09.2011, SA.32125, recital (22)

³Tariff mentioned in the Commission decision of 19.12.2013, SA.37562, recital (6)

⁴Tariff mentioned in the Commission decision of 9.12.2013, SA.35766, recital (13)

ANNEX 2: LCOE OF DOMESTIC RHI RENEWABLE HEAT TECHNOLOGIES VERSUS THE COUNTERFACTUAL

The LCOE are calculated on the total heat delivered over the 20 year lifetime of the technology. In the domestic scheme the tariff payments are converted to an equivalent 7-year payment based on renewable heat, and these values are shown in round brackets.

Table 1: LCOE of **non-domestic** geothermal and biogas heating technologies (RHT) versus the counterfactual (CF)

RHI Technology	Indicative* LCOE of RHT (p/KWh)	Indicative* LCOE of CF (p/KWh)	Difference (p/KWh)	Tariff proposal (p/KWh)	Illustrative Range (p/kWh)	Range Based On	Counterfactual Technology
Deep geothermal	9.26	4.03	5.23	5.14	4.62 - 5.84	Two data points for capex and opex	Large scale gas boilers.
Small biogas	6.62	1.77	4.85	4.43	1.68 - 8.01	Low-high opex and capex costs of RHT	Primarily offsetting gas from gas grid, including changes to overall system efficiency.
Medium biogas	5.46	1.77	3.68	3.47	1.08 - 6.29		
Large biogas	3.91	1.43	2.48	1.30	0.76 - 4.2		

* Geothermal estimates based on limited data; biogas indicative LCOE based on a different methodology.

Table 2: LCOE of **non-domestic** RHI renewable heating technologies (RHT) versus the counterfactual (CF)

The tariffs in square brackets are the tariffs offered at different tiers;

RHI technology	LCOE of RHT (p/KWh)	LCOE of CF (p/KWh)	Difference (p/KWh)	Tariff proposals (p/KWh)	Illustrative Range (p/kWh)	Range Based On	Counterfactual Technology
Solid Biomass Boilers	8.32	5.40	2.92	2.70 [2.91/ 2.05]	1.64 - 4.51	10% and 90% of Monte Carlo distribution of 1000 model runs adjusting capital cost, size, and heat use	Monte Carlo analysis on a range of Gas and Oil boilers able to deliver equivalent heat to 1-10MW biomass boilers.
Biomethane Injection	8.54	1.97	6.57	4.73 [5.35 / 3.14 / 2.42]	5.60 - 7.40	Type of plant and size (weighted tariff values across tiers shown).	Offset gas injected into the gas grid.

RHI technology	LCOE of RHT (p/KWh)	LCOE of CF (p/KWh)	Difference (p/KWh)	Tariff proposals (p/KWh)	Illustrative Range (p/kWh)	Range Based On	Counterfactual Technology
Ground Source Heat Pumps	16.48	5.40	11.08	7.38 [8.95 / 2.67]	6.71 - 13.86	Range of Capex and HLFs	Mix of ~100 kW oil and gas boilers
Air to Water Heat Pumps	9.63	5.40	4.23	2.57	2.29 - 6.66	Range of Capex and HLFs	Mix of ~190 kW oil and gas boilers
Small Solar Thermal	42.53	4.53	38.00	10.28	8.80 - 66.40	Useable days of sun and heat	Offset purchase of additional gas or oil.

Table 3: LCOE of **domestic** RHI renewable heating technologies (RHT) versus the counterfactual (CF)

RHI technology	LCOE of RHT (p/KWh)	LCOE of CF (p/KWh)	Difference (p/KWh)	Tariff proposals* (p/KWh)	Heat demand limit	Illustrative Range (p/kWh)	Range Based On	Counterfactual Technology
Air Source Heat Pumps	12.94	9.38	3.56 (10.28)	3.33 (9.62)	20,000 kWh per annum	2.10 - 4.35 (6.05 - 12.52)	Household size	Typically ~24 kW Oil Boiler
Ground Source Heat Pumps	18.39	9.26	9.13 (24.88)	7.11 (19.40)	30,000 kWh per annum	8.32 - 9.35 (22.71 - 25.41)	Household size	Typically ~30 kW Oil Boiler
Biomass Boilers	12.40	9.11	3.29 (6.34)	3.14 (6.04)	25,000 kWh per annum	2.11 - 4.23 (4.06 - 8.13)	Household size	Typically ~40 kW Oil Boiler
Solar Thermal	24.31	5.93	18.38 (35.26)	10.29 (19.74)	No limit	12.31 - 24.49 (23.63 - 47.02)	Capital cost	Offset purchase of additional domestic heating oil.

* The tariff proposals above are an expected average tariff that takes into account the impact of the heat demand limits. The average tariff is a weighted average based on the number of households above and below the threshold.