



Department for  
Business, Energy  
& Industrial Strategy

# THE RENEWABLE HEAT INCENTIVE: SUPPORT FOR BIOMASS COMBINED HEAT AND POWER

## Government response to consultation

September 2017



# THE RENEWABLE HEAT INCENTIVE: SUPPORT FOR BIOMASS COMBINED HEAT AND POWER

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The consultation can be found on the BEIS section of GOV.UK:

[The Renewable Heat Incentive – Support for Biomass Combined Heat and Power](#)

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# 1. Introduction

The Renewable Heat Incentive (RHI) supports the deployment of renewable and low-carbon heating technologies. The scheme helps to bridge the gap between the cost of renewable heating systems and the conventional alternatives. The Non-domestic RHI opened in November 2011. It supports the installation of renewable heating by businesses, charities and in the public sector, and systems supplying heat to more than one domestic property. The Domestic RHI, which provides support to individual households, opened in April 2014. Earlier this year the Government published a consultation [The Renewable Heat Incentive: Support for Biomass Combined Heat and Power](#), which ran from 10 February to 10 March 2017. This consultation asked a number of questions relating to support for biomass-CHP plant under the Non-domestic RHI scheme. This document provides the Government's decision on the proposals set out in that consultation.

## Context

In late 2015 the Government became aware that a high proportion of plant applying for the Non-domestic RHI under the biomass-CHP tariff were plant which produced a relatively low level of power compared to their heat output. The Government was concerned such plant do not necessarily face the significantly higher capital costs and/or deliver the comparatively efficient use of biomass that the biomass-CHP tariff is intended to reflect.

In response, the Government introduced a change in the support arrangements for new biomass-CHP plant joining the Non-domestic RHI scheme from 1 August 2016. The change added a new requirement for biomass-CHP plant to achieve a minimum power efficiency<sup>1</sup> in order to fully qualify for the biomass-CHP tariff for all eligible heat use. The threshold was initially set at 20%, but reduced to 10% from 1 January 2017 for a transitional period, following engagement with stakeholders. The Government then published a consultation from 10 February to 10 March 2017 to gather additional stakeholder views on:

- whether it was appropriate to limit access to the biomass-CHP tariff for plant which produce only low levels of power;

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<sup>1</sup> Power efficiency is a measure of the energy content of the electrical output of the system versus the gross calorific value of the fuel input. Its calculation is standardised under the Combined Heat and Power Quality Assurance (CHPQA) scheme and a system's power efficiency is displayed on its CHPQA certificate.

- if so, whether a power efficiency threshold was the best way to determine the extent to which a plant should receive the biomass-CHP tariff versus the biomass tariff; and
- if a power efficiency were introduced, whether it should be set at 20%.

Views were sought on these issues and whether there were other more appropriate ways of achieving the Government's objectives.

## This Document

This document sets out the rationale for the Government's decision on the introduction of a power efficiency threshold, the timeline for implementation and how the requirement will be applied.

Annex A provides the full list of questions asked in the consultation together with a detailed summary of the responses received.

Annex B provides an updated assessment of the potential impacts of the change to the power efficiency requirement.

## 2. Government Response

The Government remains of the view that access to the biomass-CHP tariff should be limited for plant which produce only a small amount of power and responses to the consultation showed clear support for this principle. The Government believes that a power efficiency requirement is the most appropriate way in which to achieve this and again the consultation showed broad support for this approach.

The question of whether the power efficiency requirement should be set at 20% received a more mixed response. Responses included proposals for a lower requirement, a phased introduction to a higher threshold and suggestions of a tiered approach. The Government has decided to implement a 20% power efficiency threshold requirement despite the differing views expressed by respondents to the consultation. The higher biomass-CHP tariff is intended to reflect the higher costs faced by biomass-CHP plant compared with biomass heat-only plant, and also to recognise the benefits, in terms of efficient use of biomass resources, such plant can deliver. The Government remains concerned about the risk of over-compensation if plants producing lower levels of power, which face relatively lower capital costs, are given full access to the biomass-CHP tariff. The Government does not feel that placing a lower power efficiency requirement on certain heat uses would be appropriate or consistent with wider tariff design on the scheme.

The Government understands that significant variation exists in the type of CHP plant and heat uses seen in installations across Great Britain. Innovation in the use of small-to-medium sized CHP plant has seen new applications within a number of sectors. Many of these developments have taken place since the start of the Non-domestic RHI scheme, including the use of screw-expander type plant in certain sectors. Whilst the overall efficiency of some plant may be high, low levels of power efficiency and relatively lower cost mean that the Government considers it is appropriate that plant with low levels of power efficiency receives proportionately lower access to the biomass-CHP tariff.

The Government recognises that, while a 20% power efficiency may not be achievable by all types of biomass-CHP plant, setting it at this level better manages the risk of over-compensation compared to the costs of building and operating the plant and the benefits they deliver.

The Government has analysed potential project remunerations under different cost scenarios. Whilst recognising that plant design and project conditions differ greatly in the market place, this analysis suggests that a 20% power efficiency requirement will still enable a range of projects employing different types of CHP technology to be deployed and for them to still achieve around a 12% internal rate of return (IRR), which is the assumed hurdle rate for non-domestic projects in the RHI. The Government does,

however, realise that for some projects made known to government during the consultation period, the impact of the increase on project economics may be more severe, be it due to much higher than usual investment cost, or because of the requirement to produce very high temperature steam. However, some respondents also indicated that future cost reductions may be attainable due to reductions in the capital cost of plant, more efficient system design and reduced project development costs. Enhancements to IRR can also be achieved for individual projects where land is already owned, feedstock is produced at no cost on-site, or where operating expenditure is found to be lower than initially planned.

The way in which support under the biomass-CHP tariff is calculated means there is no plant revenue “cliff edge” for biomass-CHP plant which have power efficiencies below 20%. Projects with power efficiencies below 20% will continue to benefit from the higher biomass-CHP tariff uplift for a proportion of the heat they generate. In addition, the introduction of the new biomass tariff will also increase the biomass only tariff component of plant revenue that such plant receive where their capacity is 1MW or above.

This decision takes place against the backdrop of wider strategic reforms to the scheme to promote deployment of the right technologies for the right uses, while ensuring the RHI contributes to both our decarbonisation targets and to the UK’s renewable energy target.

### When will it take effect?

The Government is aiming to include provisions to give effect to the 20% power efficiency threshold as part of the wider package of RHI reforms that were announced last December and which the Government aims to implement as soon as possible. The 20% power efficiency requirement will apply to all biomass-CHP applicants to the Non-domestic RHI with an application effective date on or after the date those regulations come into force.

The Government believes that this represents a reasonable transition period for industry in light of the February 2017 consultation and in light of the fact the 20% power efficiency threshold will not come into effect until later this year.

Existing biomass-CHP participants with an application effective date prior to 1 August 2016 will continue to receive the full biomass-CHP tariff for their heat output regardless of power efficiency. Participants with an application effective date between 1 August 2016 and the date on which the regulations containing the new 20% power efficiency requirement come into force will continue to have a 10% power efficiency requirement (or a 20% power efficiency requirement if the participant previously opted to retain this).

### What does this mean for me?

When the 20% power efficiency requirement comes into effect, biomass-CHP plant with a power efficiency of 20% or above will receive the biomass-CHP tariff for all eligible heat produced. For plant with a power efficiency of below 20%, the level of heat receiving the biomass-CHP tariff will reduce proportionately, with the remainder receiving the biomass heat-only tariff.

There are currently three separate biomass heat-only tariffs: the small biomass tariff for systems with capacities below 200kW, the medium biomass tariff for plant with capacities between 200 and 999kW and the large biomass tariff for plant with capacities greater than or equal to one megawatt (MW). However, the package of reforms coming into force in September 2017 will simplify the current biomass heat-only tariff arrangements, replacing the three tariffs with a single biomass-heat only tariff.

The new biomass heat-only tariff will be set initially at 2.96 pence per kilowatt hour (p/kWh). The tariff will also be tiered. Under this arrangement each installation will be eligible to receive the initial 'Tier 1' tariff for a given amount of heat use each year. Beyond this, further heat use will receive a lower 'Tier 2' tariff. The Tier 2 tariff will be set initially at 2.08p/kWh. The amount of heat for which a participant will be able to receive support at the higher Tier 1 tariff each year will be set in proportion to the capacity of the biomass system installed, with the amount being equal to the capacity of the system in kilowatts (kW) multiplied by 3,066 hours, giving a figure in kWh.

The example below illustrates how the biomass-CHP power efficiency requirements and the biomass tariff and tiering arrangement are expected to interact to determine a participant's payments (subject to the final form of the legislation) once the 20% power efficiency requirement and package of reforms are in effect.

#### **Example**

A biomass-CHP plant has a thermal capacity of 1MW and a power efficiency of 12%. In its first year of operation it has a heat output of 6GWh (or 6,000,000kWh).

Under the biomass-CHP power efficiency requirements 60% (12/20) of the plant's eligible heat use will receive the biomass-CHP tariff of 4.29p/kWh.

The remaining 40% of the heat will be supported under the biomass heat-only tariff. The plant will have an annual Tier 1 allowance of 3,066,000kWh (3,066 hours x 1,000kW). For heat use up to this level each year, the portion of heat used which is eligible for the biomass heat-only tariff will receive the Tier 1 tariff of 2.96p/kWh. For heat use beyond this level, that portion of heat use which is eligible for the biomass heat only tariff will be eligible for the Tier 2 tariff of 2.08p/kWh.

The plant's annual payment will therefore be as follows:



Biomass-CHP tariff payment:  $6,000,000 \times 60\% \times 4.29\text{p/kWh} = \text{£}154,440.00$

Biomass Tier 1 payment:  $3,066,000$  (tier threshold)  $\times 40\% \times 2.96\text{p/kWh} = \text{£}36,301.44$

Biomass Tier 2 payment:  $(6,000,000 - 3,066,000) \times 40\% \times 2.08\text{p/kWh} = \text{£}24,410.88$

**Total = £215,152.32**

## CHP Power Efficiency Requirement & Tariff Guarantees

The December 2016 Government response announced the introduction of tariff guarantees, as part of the reforms which will come into effect later this year.

Tariff guarantees are intended to help larger, more cost-effective projects to come forward. They do so by providing applicants with greater certainty regarding their eventual tariff earlier in the project cycle.

Applicants who are granted a tariff guarantee in respect of their project will have certainty that the tariff they receive will not be affected by any reductions (degressions) to the tariffs available which may take place between the time at which they are granted a tariff guarantee and the time at which they make a full application to the scheme in respect of their completed project (subject to them meeting the requirements of the tariff guarantee and the eligibility requirements of the scheme).

Biomass-CHP plant will be eligible for tariff guarantees. The December 2016 Government response gives further details of the tariff guarantee process.<sup>2</sup>

Tariff guarantees are intended only to provide certainty over the tariffs that will be available to a particular project should it be accredited to the scheme. They do not offer a guarantee that a particular project will be eligible for the scheme, or that the scheme's eligibility rules or ongoing obligations and terms of participation will not change prior to a full application being made in respect of the project.

As such, should any biomass-CHP project be granted a tariff guarantee following their introduction later this year, this would not prevent such a project from being impacted by a change in the power efficiency arrangements, or introduction of similar arrangements, should such a change be made before they make a full application to the scheme. This is because these arrangements determine only the extent to which participants are eligible for support under the biomass and biomass-CHP tariffs, and not the level of the tariffs themselves.

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<sup>2</sup> <https://www.gov.uk/government/consultations/the-renewable-heat-incentive-a-reformed-and-refocused-scheme>

### Consultation on Further Proposed Amendments to the Non-domestic RHI

In parallel with the publication of this Government response document we have published a further consultation relating to the Non-domestic RHI. This may also be of interest to stakeholders who responded to this consultation.

This covers proposals on:

- changes to eligible heat uses, particularly but not only related to drying;
- annual heat demand limits;
- changes to treatment of multiple installations of the same technology installed at the same site;
- registering to inject biomethane; and
- a range of other proposals.

# Annex A: Analysis of consultation responses

## Introduction

This annex looks in detail at the responses received to the consultation. It first summarises some information about the respondents to the consultation. It then outlines the questions contained within the consultation and summarises the responses received. The responses have served to inform the Government's decision and policy making process.

## Consultation Respondents

There were a total of 33 responses during the formal period of the consultation (10 February to 10 March 2017). Respondents comprised of trade associations, CHP installation owners, CHP system manufacturers, feedstock suppliers, project investors and energy suppliers. There was strong representation from owners and manufacturers of small-to-medium sized CHP systems.

12 respondents stated an interest in the operation of the RHI scheme across Great Britain. 8 stated a specific interest in England; a further 8 in both England and Wales; 1 in both England and Scotland; and 1 in Scotland alone.

A summary of responses to each of the questions in the consultation is set out below.

## Responses to Consultation Questions

### Question 1:

Consultation Question	
1.	<p>Do you agree it is appropriate to limit access to the biomass-CHP tariff for plant which produce only low levels of power, and support some of the heat use provided for by such plant under the standard biomass tariff?</p> <p>Yes / No. Please expand.</p>

## Summary of responses

There were 31 responses to this question. Of these responses, 25 respondents (81%) agreed that it was appropriate to limit access to the biomass-CHP tariff for plant which only produce low levels of power. Six respondents disagreed with the proposal (of which one was a membership organisation where the consensus was against the power efficiency threshold).

There was widespread acknowledgement of the need to ensure value for money, both for the biomass-CHP tariff and on the Non-domestic RHI more widely. Limiting the value of RHI payments under the biomass-CHP tariff for those installations with very low levels of power efficiency was considered to be appropriate by many stakeholders. One respondent highlighted that the additional capital cost of operating as a CHP installation (as opposed to biomass heat output only) could be low for plant with a very low power efficiency.

Those who disagreed with the power efficiency threshold cited the specific impact that the requirement might have on small and medium-sized plant. Some respondents highlighted how increased power generation may not be achievable for many of these installations without delivering a lower temperature heat output. It was noted that a 20% power efficiency requirement could have the perverse incentive of encouraging inefficient use of heat at lower temperatures (e.g. drying floors) so as to maximise power generation.

Respondents also noted that the 20% power efficiency requirement may stifle the development of smaller scale CHP systems in rural locations where power generation can have a role to play in meeting on-site electricity needs, reducing grid congestion and displacing fossil fuel power generation.

## Questions 2 and 3:

Consultation Question	
2.	Do you agree that the use of a power efficiency threshold is the best way to determine the extent to which a plant's heat output is paid for under the biomass-CHP tariff, with the remainder paid for under the biomass tariff? Yes / No.
3.	If 'No' to Question 2, what method would be more appropriate, and why?

## Summary of responses

There were 30 responses to question 2. Of these, 24 respondents (80%) agreed that a power efficiency threshold is the best way to determine the extent to which a plant's heat output is paid for under the biomass-CHP tariff. Four respondents disagreed with the proposal and two had mixed views.

It was noted that the power efficiency requirement may incentivise installations to increase power output so as to maximise their RHI tariff, leading to lower temperature heat output and overall system efficiency.

Eight responses were received regarding alternative methodologies. Two suggested a proposal for a two-tiered approach to power efficiency based on different temperatures of heat produced. This approach proposed a lower power efficiency requirement on those systems with higher temperature heat uses.

Three respondents suggested a differential power efficiency requirement based on plant capacity, with larger installations subject to higher power efficiency thresholds.

One response suggested that the CHPQA methodology for calculating the electrical efficiencies for biomass plant should be reviewed so as to ensure appropriate treatment of the calorific value of biomass fuels.

One respondent supported an approach that would quantify the usable heat delivered based on the end heat use, so as to mitigate against generating lower temperature heat to maximise power efficiency.

A further response noted the need to consider whole system efficiency with regards to heat and power output, alongside the relevant support mechanisms available through the RHI, Renewables Obligation and Contracts for Difference.

## Questions 4 and 5:

Consultation Question	
4.	Do you agree a power efficiency threshold of 20% is appropriate? Yes / No
5.	If 'No' to Question 4, what threshold would you suggest, and why?

## Summary of responses

There were 31 responses to question 4, with 5 respondents agreeing that a power efficiency threshold of 20% is appropriate. Those who agreed cited that a 20% requirement would serve to incentivise high efficiency installations and raise standards through the supply chain.

22 respondents disagreed with the proposal and 4 had mixed views. Of those with mixed views, there was support for a 20% requirement for larger projects but lower thresholds for smaller scale projects and those with higher temperature heat uses.

Many respondents explained how a 20% power efficiency requirement would not be achievable for small and medium-sized plant using Organic Rankin Cycle (ORC) and screw-expander technologies. A 20% requirement was felt to be more applicable to steam turbine-based plant that share similarities with larger gas-fired systems under the CHPQA. It was highlighted that a 20% requirement could have the perverse outcome of leading small and medium-sized plant to maximise electrical output and in turn produce lower temperature heat that is not suitable for certain heat uses.

A number of alternative proposals were proposed, including the option of differential power efficiency requirements based on heat output temperature or electrical capacity of the plant. A further response proposed a phased requirement so as to maintain current investment levels and incentivise further innovation from industry over time.

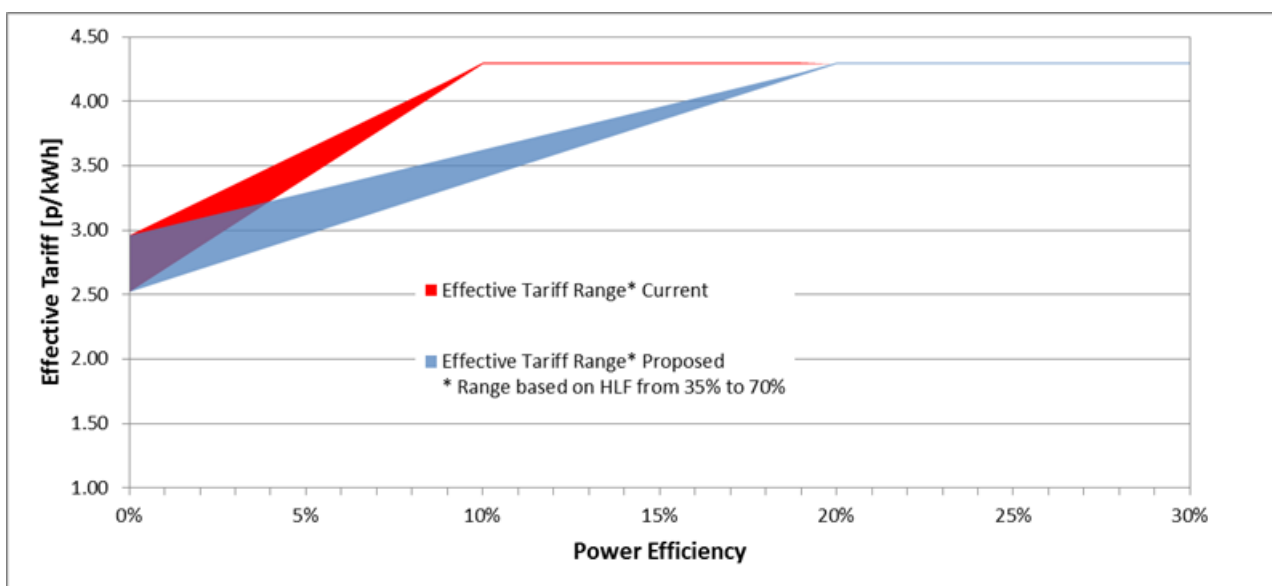
# Annex B: Assessment of Impacts

## Impact on potential applicants

This assessment considers the impact of changes to the power efficiency requirement for biomass-CHP. It considers the current arrangements (a 10% power efficiency threshold), versus the proposed new 20% power efficiency requirement. For the purposes of this analysis the current biomass-CHP tariff of 4.29p/kWh and the reformed biomass tariff of 2.96p/kWh at tier 1 and 2.08p/kWh at tier 2 were used. The Government has considered potential impacts on different technology types and on projects with different end heat uses.

## Effective Tariffs

The Chart below shows the “effective tariff” available to biomass-CHP plant with different power efficiencies under the current regulations (a 10% power efficiency threshold) and under the new arrangements when they come into force (a 20% power efficiency threshold). The “effective tariff” represents the combination of applicable RHI payments available to a biomass-CHP project, consisting of the biomass-CHP, and the reformed biomass tier 1 and tier 2 heating tariffs. The “effective tariff” represents that average tariff, which, if applied to the total heat generated, would provide the project with the same total annual RHI payment as the tariff combination described and determined under the power efficiency requirements.



Where the “effective tariff” is represented by a range (area) on the chart, this shows the potential impact of different Heat Load Factors (HLF) on the actual annual RHI payout. Plant with a lower HLF have a higher effective tariff relative to those with a higher HLF as they are paid the higher biomass heat-only tier 1 tariff for a greater proportion of their heat use. The higher effective tariff in the range represents a HLF of 35% or less (i.e. all biomass heat paid at tier 1), while the lower end of the range represents a HLF of 70% (i.e. biomass heat paid half at tier 1 and half at tier 2). This is independent of the power efficiency of the plant.

For both the current (10%) and future (20%) thresholds, a 0% power efficiency effectively results in payment of the prevailing biomass boiler tariff in accordance with the Government response to the consultation on reform of the RHI, published in December 2016<sup>3</sup>. Payout then rises to be equal to the biomass-CHP tariff at the relevant power efficiency threshold of 10% (current requirement) or 20% (future requirement). Plant displaying a power efficiency above the power efficiency requirement are paid entirely at the biomass-CHP tariff.

Our understanding of typical power efficiency ranges for different CHP plant applying to the RHI are as follows: screw-expanders (3 - 8%), ORCs (5 - 17%) and steam-turbines (7 - 40%). Based on these power efficiencies, likely effective tariff ranges by technology type would be:

- Steam-turbine plant: 3.15 to 4.29p/kWh
- ORC plant: 2.95 to 4.1p/kWh
- Screw-expander plant: 2.8 to 3.5p/kWh

Actual achieved power efficiency rates will depend on numerous factors, such as the temperature of heat produced, system design, and the choice of electricity producing equipment and technology. Applicants will need to consider what the appropriate technology is to meet their projects’ specific heat and power requirements.

The Government has analysed potential project remunerations under different cost scenarios. Whilst recognising that plant design and project conditions differ greatly in the market place, this analysis suggests that a 20% power efficiency requirement will still enable a range of projects employing different types of CHP technology to be deployed and for them to still achieve around a 12% IRR, which is the assumed hurdle rate for non-domestic projects in the RHI. The Government does, however, realise that for some projects made known to the Government during the consultation period, the impact of the

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<sup>3</sup> The reforms will merge the existing tariff bands for ‘small’ (less than 200kW), ‘medium’ (between 200kW and 999kW) and large (1MW+) biomass boilers to create a single tariff band for all biomass plant. The reforms will also alter the current tiering arrangements for the small and medium bands and introduce tiering for large biomass boilers for the first time.



increase on project economics may be more severe, be it due to much higher than usual investment cost, or because of the requirement to produce very high temperature steam. However, some respondents also indicated that future cost reductions may be attainable due to reductions in the capital cost of plant, more efficient system design and reduced project development costs. Enhancements to IRR can also be achieved for individual projects where land is already owned, feedstock is produced at no cost on-site, or where operating expenditure is found to be lower than initially planned.

Given this complex range of factors, the impact of the change to a 20% power efficiency requirement will differ from project to project: some projects may continue as biomass-CHP plant, some may choose to go ahead as biomass heat-only projects and some may no longer be developed.

### **Impact on Biomass-CHP deployment and RHI Spend**

The Government's assessment of the potential impact of a 20% power efficiency requirement on biomass-CHP deployment, RHI costs and benefits was set out in the [consultation document](#). This assessment remains the Government's best assessment of the potential impacts on biomass-CHP deployment, RHI costs and benefits of a 20% power efficiency requirement. As previously stated in the consultation document, this assessment should be seen as independent of our December 2016 Impact Assessment and produced in order to estimate the order of magnitude of impacts of the proposals, but does not address the interdependencies of the scheme as a whole resulting from, for example, scheme wide budget management mechanisms.

For ease of reference the key points from the assessment of impacts included in the consultation are set out again below.

There is currently a strong pipeline of applications for biomass-CHP systems coming on to the RHI. The government recognises that many of these systems will be applications seeking to come on to the scheme prior to a change to the power efficiency requirement. However, over the past year the biomass-CHP market has developed in a way which means there will likely be continued deployment of biomass-CHP systems in the period 2016/17 to 2020/21.

Assessing the change in deployment likely to result from these proposals is difficult as it involves comparing two hypothetical project pipelines over a four year period. In order to make an order of magnitude assessment of the impact of the proposal, the Government has taken a view as to the likely change in the total affected market over the 2017/18 to 2020/21 period. This has been based on evidence from current statistics on scheme deployment, information on the near term project pipeline gathered from engagement with industry stakeholders, and expert opinion from within Government. The Government also notes that projects which do not come forward and apply as biomass-CHP projects

following the changes outlined in this response may still come forward in future and apply to the scheme as biomass heat-only installations.

In total the Government believes the proposed change could mean lower total deployment of biomass-CHP plant over the period up until the end of 2020/21 than if the current threshold of 10% was left unchanged. The Government judges that this reduction could be in the order of between 200GWh and 300GWh of heat generation per year. At the current tariff, the lower deployment would then result in lower scheme spend of around £10m per year (in real terms, 2016/17 prices), compared to the hypothetical case of leaving the current threshold of 10% unchanged.

### **Impact on RHI Costs and Benefits**

For the purpose of translating changes in heat generation into changes to costs and benefits of the scheme, we have used the same characteristics as large biomass projects. This is because we believe that on the whole, biomass-CHP systems with a power efficiency lower than 20% will be servicing markets, and display resource cost and counterfactual characteristics, which are more in line with large biomass boiler installations than the large scale turbine systems which form the basis of our typical CHP evidence base. This assumption has not been used in the assessment of the impact on potential applicants above, but is to provide an assessment of the order of magnitude of the change to scheme costs and benefits that are likely to occur as a result of the proposals.

Using the assumptions outlined, the loss in benefits from the proposed change would be around 0.3MTCO<sub>2</sub>e less non-traded carbon abatement over Carbon Budget 4, or 1.1MTCO<sub>2</sub>e less non-traded carbon abatement over the scheme lifetime (out to 2040/41). The impact on the scheme's Net Present Value (NPV) would be a reduction in the value of carbon abatement of around £60m over the scheme lifetime, a reduction in Air Quality benefits of around £15m over the scheme lifetime, and a resource cost savings of around £50m partly offsetting these. However, the calculation of NPV does not directly include the impact of potential overcompensation effects, or changes to the position on government spend. Overall the proposals are estimated to reduce the NPV of the scheme by around £25m over the scheme lifetime but to reduce Government expenditure by around £150m over the same period (all figures in 2016/17 prices).