Title: **Introduction of air quality requirements into the Renewable Heat Incentive (RHI)** **IA No: DECC0092** **Lead department or agency:** Department of Energy & Climate Change (DECC) **Other departments or agencies:** Department for Environment Food and Rural Affairs (Defra)	Impact Assessment (IA) **Date:** 13/7//2012 **Stage:** Consultation **Source of intervention:** Domestic **Type of measure:** Secondary legislation **Contact for enquiries:** Daniel Newport (0300 068 6023), Andrej Miller (0300 068 6155)
Summary: Intervention and Options	**RPC:** RPC Opinion Status

Cost of Preferred (or more likely) Option				
Total Net Present Value	**Business Net Present Value**	**Net cost to business per year**	**In scope of One-In, One-Out?**	**Measure qualifies as**
£m **2,523.8**	N/A	N/A	No	N/A

What is the problem under consideration? Why is government intervention necessary?

The combustion of biomass in renewable heat generation creates, through the emissions of air pollutants, a negative externality. Although the impact of biomass heat generation is currently small, due uptake expected to be driven by the RHI subsidy future biomass air pollution may result in a material cost to society. Air pollutants reduce the air quality of an area which can adversely affect public health, damage ecosystems, biodiversity and habitats. The impact is particularly acute in urban and suburban areas. The RHI in its current form does not take these negative externalities into account and over-incentivises the generation of unfiltered biomass based renewable heat.

What are the policy objectives and the intended effects?

The policy objective is to reduce the potential for harmful emissions from biomass heat installations and through this reduce adverse effects of air pollution on public health and the environment, without resulting in substantial reduction in deployment of renewable heat, which is a key contributor to the UK's legally binding 2020 renewables target. The policy also avoids the RHI harming UK progress to achieving EU air quality standards.

What policy options have been considered, including any alternatives to regulation? Please justify preferred option (further details in Evidence Base)

Option 1: (Do-nothing-option) The RHI policy as currently implemented represents the do-nothing option.
Option 2 (preferred option):. Introduces the previously consulted on emission limit criteria into the RHI and makes RHI support conditional on complying with emission limits of 30 g/GJ net for particulate matter (PM_{10}) and 150 g/GJ net for oxides of nitrogen (NOx). Biomass heat generators applying for RHI support have to document compliance by submitting an appropriate "RHI emission certificate" to the regulatory body (Ofgem). A level which is considered achievable with some additional cost but not expected to substantially reduce deployment of renewable heat.

Will the policy be reviewed? It will be reviewed. **If applicable, set review date:** Month / Year						
Does implementation go beyond minimum EU requirements?			**N/A**			
Are any of these organisations in scope? If Micros not exempted set out reason in Evidence Base.	**Micro Yes**	**< 20 Yes**	**Small Yes**	**Medium Yes**	**Large Yes**	
What is the CO2 equivalent change in greenhouse gas emissions? (Million tonnes CO2 equivalent)			**Traded: - 3.60**	**Non-traded: 2.47**		

I have read the Impact Assessment and I am satisfied that, given the available evidence, it represents a reasonable view of the likely costs, benefits and impact of the leading options.

Signed by the responsible Minister: Greg Barker Date: 29 June 2012

Summary: Analysis & Evidence Policy Option 2

Description: Proposal of making Renewable Heat Incentive support for biomass based heat generation conditional on PM_{10} and NOx emission limits.

FULL ECONOMIC ASSESSMENT

Price Base Year	PV Base Year	Time Period Years	Net Benefit (Present Value (PV)) (£m)		
			Low:	High:	Best Estimate:
2010	2011	29	78.2	5,454.9	2,523.8

COSTS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Cost (Present Value)
Low	n/a		n/a	n/a
High	n/a		n/a	n/a
Best Estimate	0.0		-14.5	- 420.0

Description and scale of key monetised costs by 'main affected groups'

DECC estimates a total cost increase of £420m due to an increase in average capital expenditure on biomass installations to meet the emission limits.

Other key non-monetised costs by 'main affected groups'

Additional certification and testing costs for manufacturers of biomass boilers are assumed to be negligible.
Additional administration costs to Ofgem are uncertain and are set to zero in this IA. DECC will seek to work with Ofgem to improve the estimate of administrative costs during the consultation period.

BENEFITS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Benefit (Present Value)
Low	0.0		17.2	498.2
High	0.0		202.6	5,874.9
Best Estimate	0.0		101.5	2,943.8

Description and scale of key monetised benefits by 'main affected groups'

The monetised benefits take account of the mortality effects and morbidity effects of the improvement in air quality into account. Defra estimates that these benefits amount to £2,931m over the lifetime of the policy.

Other key non-monetised benefits by 'main affected groups'

The benefits do not reflect the impacts of an improvement in air quality on the ecosystem and biodiversity.

Key assumptions/sensitivities/risks **Discount rate** **3.5**

This IA requests evidence to assist a number of assumptions where evidence is currently uncertain:
- This IA assumes the introduction of emission limits increases capital expenditure on biomass installations by 10% (15% non-domestic urban areas). We have run sensitivities on the resource cost increase per biomass installation assuming a high cost scenario of a 25% increase.
- The certification and testing of boilers only gives rise to negligible costs.
- DECC will seek to work with Ofgem to develop the estimate of administrative costs.

BUSINESS ASSESSMENT (Option 1)

Direct impact on business (Equivalent Annual) £m:			In scope of	Measure qualifies
Costs: n/a	Benefits: n/a	Net: n/a	No	N/A

Evidence Base

I. Problem under consideration

1. The combustion of biomass in renewable heat generation is a source of air pollutants, a negative externality leading to market failure in the biomass renewable heat market. Although the contribution of biomass heat generation is currently still small, the projected growth in RHI driven deployment of biomass combustion over the next decade means that in aggregate biomass air pollution would in the future incur a material cost to society.

2. The most significant air quality impacts from biomass stem from particulate matter (PM_{10}) and oxides of nitrogen (NOx) emissions. These air pollutants reduce outdoor air quality which adversely affects public health, particularly in urban and suburban areas. Reduced air quality also damages ecosystems and habitats and has negative effects on biodiversity. There are also clear links between air pollutants and the sources of greenhouse gases that cause climate change.

3. The levels of PM and NOx in the UK are relatively high when measured against European Directive targets and the UK seeks to reduce these levels to avoid infraction.

4. Any negative air quality impacts depend on the size of the biomass installation. The emissions of biomass installations above 20MWh capacity are covered by regulation.
   There are, however, currently no emission performance standards for biomass boilers of under 20 MW size in the UK and installations and installations of this size are currently not adequately covered by other legislation.

II. Rationale for intervention

5. The emissions of PM and NOx are a negative externality of biomass combustion. The Renewable Heat Incentive (RHI) is designed to incentivise the replacement of heat generation based on fossil fuel with renewable heat technologies, including biomass combustion. As the RHI in its current form does not take account of the negative externalities of PM and NOx emissions from unfiltered combustion of biomass it potentially leads to excess emissions. The introduction of air quality considerations into the RHI will lead to a welfare improvement for society, as long as the cost of compliance do not outweigh the benefits.

III. Policy objective

6. The policy objective is to reduce harmful emissions from biomass heat installations and through this reduce adverse effects of air pollution on public health and the environment without resulting in substantial reductions in the deployment of renewable heat. The UK has a legally binding target of 15% of all energy coming from renewable sources by 2020. The contribution of the RHI, and biomass boilers in particular, to this target is considered cost effective compared to alternative options. Therefore any loss of deployment of biomass will need to be replaced by deployment of other renewable technologies (most likely Offshore Wind) at considerable additional cost.

7. Existing EU legislation[1] and UK laws[2] set legally binding limits for concentrations of major pollutants in outdoor air such as particulate matter (PM_{10} and $PM_{2.5}$) and nitrogen dioxide (NO_2). Introducing air quality criteria into the RHI will support the UK's effort to progress towards compliance with these limit values.

[1] 2008 ambient air quality directive (2008/50/EC); 4th air quality daughter directive (2004/107/EC)
[2] EU directives have been made law in England, Scotland, Wales and Northern Ireland through regulations, for example in England, through the Air Quality Standards Regulations 2010.

IV. Options considered

8. For the purposes of this IA, two options have been assessed. The expected impact of the introduction of emission limits into the RHI is compared to the do-nothing-option.

1. Option 1: Do Nothing

9. The RHI policy as currently implemented represents the "do-nothing" option, the counterfactual scenario against which option 2 will be measured. As the costs to society of the air quality reduction are external to the biomass heat production under option 1 and producers face no abatement costs they would be expected to continue to emit pollutants above the efficient level. This is also true for those producers receiving RHI support. It is possible that some generators would install boilers that meet the criteria anyway, for example, those in urban areas which already face restrictions or those with high specification boilers. Defra assess the likely "average" counterfactual emissions standards to be 60 g/GJ[3] net for PM and 150 g/GJ net for NOx.
10. A list of biomass boilers that were on the market in the UK in 2010 shows that approximately 40% of boilers were already expected to comply with the PM_{10} emissions limits of 30g/GJ, whereas 10% were also certified to comply.

	Biomass boilers with emission limits **<45g/GJ**		
	MCS approved biomass boilers (number of boilers **with evidence** of meeting PM_{10} emission limits **<30g/GJ)**	MCS approved biomass boilers **expected** to comply with PM_{10} emission limits **<30g/GJ**	MCS approved biomass boilers with PM_{10} emission **>45g/GJ**
Wood Pellets	164 (23)	61	73
Wood Chips	32 (0)	21	56
Wood Logs	40 (3)	14	9
Total	**236 (26)**	**96**	**138**

2. Option 2: "30/150" emission limits with test house certification

11. Under option 2 RHI financial support would only be given to renewable heat generators using biomass installations that comply with previously consulted-on emission limits of 30g/GJ[4] net for particulate matter (PM_{10}) and 150g/GJ net for oxides of nitrogen (NOx). Biomass heat generators applying for RHI support have to document compliance with the 30/150 emission limits by submitting an appropriate "RHI emission certificate" (RHI-ec) to Ofgem in their application. These emission certificates must be issued by an accredited[5] test house[6].

12. In the 2010 RHI consultation, DECC consulted on the suitable limits of emissions. The option of limits tighter than 30/150 was rejected as on consultation with stakeholders and Defra it was considered they would rule out most currently produced biomass boilers.

13. The following groups are expected to be impacted by option 2:
    a) The general public will benefit from the improvement in air quality.
    b) A second group to be affected directly are heat generators who switch from fossil fuel based to biomass based heat generation and who apply for RHI support. They have to ensure that their installation meets air quality requirements and submit the documentation together with their RHI application to demonstrate their compliance.

[3] grams pollutant per GigaJoule net thermal input
[4] grams pollutant per GigaJoule net thermal input
[5] accredited in accordance with ISO 17025 by a member of the European co-operation for Accreditation, or International Accreditation Forum Multilateral Recognition Agreement.
[6] Manufacturers of boilers below 5MWth output will be able to obtain RHI emission certificates for a boiler type. Boilers with individual specifications and all those above 5MWth output will require testing at the point of commissioning of the plant. An RHI-ec can also be obtained for any specific combination of boilers fitted with abatement equipment if compliance can be demonstrated by on-site testing. Instead of a RHI emission certificate a current environmental permit for a particular boiler installation can be submitted as acceptable alternative.

c) The RHI administrator, Ofgem, takes over additional duties to ensure RHI applications are accompanied by adequate emission certificates.
d) Indirectly, manufacturers and installers of biomass boilers may be affected by the policy as demand will switch to boilers which can comply with the air quality limits.

14. Although the option of pricing-in the externality (through differentiated tariffs for different levels of emissions) was considered, the tariffs would need to be set at different levels for a large suite of available boilers to correctly internalise the externality. This would create a complex landscape and come with high costs through assessing and setting the relevant tariffs for each product, and changing these as product specifications change. Setting efficient price differentials would also be problematic. Further, as the benefits of reduced NOx and PM emissions are far in excess of the costs of reducing them, the differentiated tariff approach would be expected to achieve the same result (all boilers would be expected to meet the "30/150" standard). Policy option 2 therefore suggests to reduce emissions through imposing emission limits instead of correcting the externality through pricing.

V. Monetised and non-monetised costs and benefits of option 2 and Net Present Value

1. Costs of option 2

15. The policy introduces additional resource costs to the production of RHI supported renewable biomass heat and increases the costs of administering the policy.

i.) Resource costs

16. Resource cost will increase relative to the RHI as currently implemented (option 1). The additional resource costs primarily originate from an increase of capital expenditure for biomass boilers with integrated or added abatement equipment. Resource costs also include a range of costs associated with documenting compliance with the policy, such as testing and certification.

17. When modelling resource costs in the context of the RHI we have taken costs of renewable heat technologies net of costs of counterfactual technologies into account. The net costs include capital expenditure, operational expenditure, fuel costs and monetised barrier costs. In order to reflect the requirements introduced under option 2 we have assumed an increase of capital expenditure based on an assessment by AEA[7]:

a) The capital expenditure associated with non-domestic biomass boilers in urban areas has been increase by 15%, which represents the additional cost of acquiring abatement equipment for these installations.
b) The capital expenditure associated with all other biomass boilers and District Heating installations in urban and non-urban areas has been increased by 10%, which represents the additional cost of acquiring a biomass boiler with higher specifications meeting the emission.

The 10% (15%) increase represents an average increase. The cost estimates are highly uncertain and are likely to differ from installation to installation. It is to be assumed that high-specification boilers already comply with the emission criteria proposed under option 2.

18. ***DECC would appreciate any information on the estimated additional cost of meeting these standards, for different sizes and applications of boilers.***

19. RHI model estimates suggest that the higher capital expenditure incurred under option 2 leads to a total resource cost increase of £420m over the lifetime of the policy to 2040[8]. The impact on total resource costs is the outcome of two effects: an increase due to the increase in capital

[7] AEA (2010), *Review of technical information on renewable heat technologies*, section 2.3.
[8] RHI applications can be filed until 2020 when the last supported installations will start receiving RHI support which then is paid out for 20 years. The last payments under the RHI will therefore be made in 2040.

expenditure for each biomass installation and a decrease of total resource costs as the total number of biomass installations taken up under the RHI will fall. The estimates suggest that the capital expenditure effect dominates. The latter effect is very small in this case.

20. The additional capital expenditure is uncertain and varies from case to case. We therefore have run sensitivities around the 10%/15% values, presented in part VI. below.

21. The testing and certification process, involving an accredited test house, will generate costs for heat generators, manufacturers or importers/installers. Heat generators may purchase type-approved certificated biomass boiler from an installer or manufacturer. In this case the additional costs fall on the boiler manufacturer who may pass them through in the equipment price. Alternatively the certification costs may directly fall on the heat generator if compliance has to be demonstrated by on-site testing, e.g. in the case of retrofitting abatement equipment to existing boilers. In both cases the costs of generating renewable heat through combustion of biomass increases under the RHI.

22. The certification costs are expected to be very low. It is therefore considered here as part of the average increase in capex in the central scenario***. DECC would appreciate further information on the likely certification costs.***

23. Although the resource costs of RHI supported biomass heat generation rises option 2 is only expected to have a very small impact on the total modelled renewable heat generated under the RHI. The total renewable heat generated under option 2 versus option 1 is predicted to fall by 0.39%, a difference of -3.1TWh over the lifetime of the policy. This is due to the expectation that under current tariffs and cost evidence for biomass, supply chain growth will be marginally binding over the period to 2020. So a small increase in costs (10% capex increase translates to roughly a 3-4% levelised cost increase), does not materially impact modelled deployment.

24. Similarly, the resource cost increase from option 2 is estimated to lead to a negligible between-technologies-effect: The mix of technologies generating the total renewable heat under the RHI is not expected to change materially as the supply of biomass was before considered the binding constraint in many sectors of modelled uptake.

25. Finally, it is not considered likely that any deployment will take place outside the RHI as a result of these regulations as the cost of meeting the regulation is lower than the subsidy offered.

ii.) Administrative costs

26. Option 2 will increase Ofgem's costs of administering the RHI policy as the RHI emission certificate has to be taken into account in the application process of the RHI. At the time of introduction the policy change may also generate transitional staff training costs. However, the approach set out in Annex C of the consultation paper limits Ofgem's additional work to checking yes/no answers.

27. DECC will seek to work with Ofgem to develop an estimate of administrative costs during the consultation period.

28. We assume that the accreditation process of testing houses guarantees that boiler certificates handed in to Ofgem will be of good quality. The risks of certificate fraud is assumed to be very low and no on-site auditing is necessary to reinforce compliance. Both these assumptions will be revisited in the final impact assessment.

2. Benefits of Option 2

i.) Impacts on air quality from RHI supported biomass combustion

29. Biomass installations result in negative air quality impacts where they replace gas heating. The proposed regulations are expected to reduce the negative air quality impacts of RHI supported biomass combustion. DECC has worked with Defra to assess and quantify the air quality impacts of the RHI.

30. The most significant air quality impacts are expected to come from particulate matter (PM_{10}) and oxides of nitrogen (NOx) emissions from the combustion of biomass. Where the counterfactual technology being replaced is a non net-bound fuel such as heating oil or coal, the impacts can be positive, however, where biomass is displacing electricity or gas fired heat, the impacts are negative. These impacts are felt more strongly in areas of high population density, or urban areas, but are less pronounced in rural areas although there is no difference in terms of total national emissions and the World Health Organisation advise that there is no safe exposure level to PM.

31. The impacts also depend on the size of the biomass installation. The regulatory regimes that apply to different sizes are:
    a) Large scale installations (over 50MW): Emissions from biomass installations are regulated by the Integrated Pollution Prevention Control (IPPC) legislation administered by the Environment Agency or the Scottish Environment Protection Agency.
    b) Installations of 20 to 50MW: Individual units are regulated by the Scottish Environment Protection Agency or local authorities in England and Wales.

    Below 20MW, there is currently no regulation that applies across the UK beyond the Clean Air Act 1993 which limits the emission of dark smoke. This requires appliances burning over 45.4kg/hour of solid fuel to agree with the local authority appropriate height for the chimney height and dust arrestment equipment.

ii.) Air quality impact modelling

32. The proposed regulations provide the maximum emission standards for biomass boilers of 30g/GJ for particulate matter and 150g/GJ for nitrogen oxide for the boilers to be eligible to be incentivised. In the results presented below these limits are referred to as emission limit values (ELVs). The air quality impact of two RHI scenarios were examined: these correspond to the scenarios under option 1 and option 2.

33. The social costs owing to these air pollutant emissions were estimated following best practice appraisal approaches as agreed by the Defra led Interdepartmental Group on Costs and Benefits (IGCB)[9]. The work was undertaken by AEA using the Pollution Climate Mapping model. Input data from the DECC October 2012 energy projections has been used by the National Atmosphere Emission Inventory (NAEI) to generate emissions projections. These were used together with data from DECC on the projected uptake from the Phase 1 RHI (option 1) and as modified by the requirement for maximum emission standards (option 2) to estimate future air quality and the resulting changes in health and associated social costs. The impacts of biomass burning on AQ depend not only on the amount of biomass burned but also on factors such as where the biomass combustion plants are located. Ecosystem impacts were not assessed.

34. Table 1 below shows a summary of the two scenarios used to estimate the AQ impacts

[9] http://www.defra.gov.uk/environment/quality/air/airquality/panels/igcb/pathway.htm

Table 1: Assumptions on biomass burned for calculation of Air Quality Impacts

TWh by 2020	Current RHI -without AQ requirements (under option 1)	RHI with AQ requirements proposed (under option 2)
Total 2020 RHI biomass PM_{10} emission [ton]	3,513	1,446
Total RHI biomass NO_x emission [ton]	841	721
Total biomass benzo[*a*]pyrene emission [kg]	194	191

Table 2: Air Quality Modelling results

2020 Population weighted mean concentration	Current RHI -without AQ requirements (under option 1)	RHI with AQ requirements proposed (under option 2)
PM_{10} µg/m^3	14.338	14.259
$PM_{2.5}$ µg/m^3	9.579	9.504
Nitrogen dioxide (NO_2) µg/m^3	13.401	13.404
Benzo[*a*]pyrene ng/m^3	0.248	0.248

35. Based on these potential uptakes the impacts on air quality were estimated (see Table 3). The social costs of the air quality impact quantify and monetise mortality effects, in terms of life years lost and deaths brought forward, and morbidity effects, in terms of hospital admissions and restricted activity days. The central, low and high cost estimates are based on different assumptions about the percentage change in relative risk of all causes of mortality per 10 µg/m^3 change in annual average $PM_{2.5}$ emissions. The 6% is the central value adopted by the Department of Health's Committee on the Medical Effects of Air Pollution (COMEAP). The 1% and 12% coefficients represent the typical 'low' and 'high' values suggested by COMEAP for sensitivity analysis as the upper and lower bounds of a 75% plausibility interval.

Table 3: Social Costs of Air Quality Impact

Lifetime social cost of air quality impacts [£m, Present Value, 2020 prices**]			
	Costs – RHI without air quality requirements (option 1)	**Costs – RHI with air quality requirements (option 2)**	**Social benefit from air quality impact of option 2** (difference) [£m, PV, 2020prices]
	No Emission Limit Values	Emission Limit Values of PM_{10} –30g/GJ and NOx– 150g/GJ	
Low (1%)	80	26	**54**
Central (6%)	**481**	**155**	**326***
High (12%)	962	310	**652**

**Value used in summary sheet*
***Here 2020 prices shown but deflated to 2010 prices for the purposes of cost benefit analysis*

36. These estimates show that the introduction of air quality criteria significantly reduces the health impacts of the RHI from its current form.

3. Net Present Value of option 2

Table 4: Net Present Value calculation

Year	Additional Resource Cost [£m]	Value of Impact on Carbon Saving* [£m]	Benefits from Air Quality requirements CENTRAL [£m]	Benefits from Air Quality requirements LOW [£m]	Benefits from Air Quality requirements HIGH [£m]
2012	-0.3	-0.1	3.7	0.6	7.4
2013	-1.0	-0.3	9.1	1.5	18.2
2014	-2.3	-0.3	22.8	3.8	45.6

2015	-8.0	0.8	37.3	6.2	74.6
2016	-16.0	2.0	58.4	9.7	116.8
2017	-21.6	2.5	84.5	14.0	168.9
2018	-26.5	2.5	114.6	19.0	229.1
2019	-27.2	1.8	148.2	24.5	296.4
2020	-25.3	1.2	183.1	30.3	366.2
2021	-24.2	0.8	176.9	29.3	353.8
2022	-23.4	0.5	170.9	28.3	341.9
2023	-22.6	0.3	165.2	27.4	330.3
2024	-21.8	0.0	159.6	26.4	319.1
2025	-21.1	-0.2	154.2	25.5	308.3
2026	-20.4	-0.2	149.0	24.7	297.9
2027	-19.7	-0.2	143.9	23.8	287.8
2028	-19.0	-0.2	139.1	23.0	278.1
2029	-18.4	-0.1	134.3	22.3	268.7
2030	-17.8	0.0	129.8	21.5	259.6
2031	-17.2	0.2	125.4	20.8	250.8
2032	-16.4	0.6	119.3	19.8	238.6
2033	-15.5	1.2	112.5	18.6	224.9
2034	-14.3	1.5	101.6	16.8	203.2
2035	-11.0	0.8	90.5	15.0	181.0
2036	-6.4	-0.3	76.2	12.6	152.4
2037	-3.1	-0.8	59.5	9.9	119.1
2038	-0.2	-0.9	41.0	6.8	82.0
2039	0.6	-0.3	20.7	3.4	41.5
2040	0.1	0.0	0.0	0.0	0.0
Total	-420.0	12.7	2931.1	485.5	5862.2

	Central	**Low**	**High**
Total costs	-£420m		
Value CO_2 savings*	£12.7m		
Total benefits:	£2,943.8m	£498.2m	£5,874.9m
NPV:	**£2,523.8m**	**£78.2m**	**£5,454.9m**

*Carbon saving changes are a result of small changes in expected uptake profile (see point 48).

37. The increased resource costs of £420m (through the impact of increased capital costs), result in an estimated benefit of £2,931m in Air Quality improvements.

38. Although NPV is high and positive, further tightening of limits was considered likely to severely impact potential deployment, which would come at much higher cost, as the cost of losing 1TWh of biomass would be both the associated carbon savings but also the lost contribution to the 2020 renewables target. The marginal technology for meeting this target is assessed to be Offshore wind.

VI. Assumptions and Sensitivities

39. Our Net Present Value result is based on a number of assumptions. These include:
    - The introduction of emission limits increases capital expenditure on biomass installations by 10% (15% for non-domestic urban areas).
    - The certification and testing of boilers only gives rise to negligible costs.
    - Ofgem's additional administration costs are set to zero in this IA. DECC will seek to work with Ofgem to develop the estimate of administrative costs during the consultation period.

Sensitivities - resource cost modelling assumptions

40. The introduction of the emission limits increases total resource costs. Our estimates so far assume that this rise can be adequately modelled as a 10%/15% increase in capital expenditure of biomass boilers and that the certification and testing of boilers only gives rise to negligible costs.

41. DECC is aware that this is an area of uncertainty for cost assumptions. We therefore have run a sensitivity on the resource cost increase per biomass installation.
    In a high cost scenario we assume that the increase of total resource cost, including capital expenditure and certification cost, is modelled as a 25% increase of capital expenditure. Total resource costs under this scenario falls by £321.3m, instead of rising by £420m in the central scenario. This results in £741m lower resource costs, caused by lower deployment. With a 25% capital expenditure increase the total renewable heat generated under option 2 versus option 1 is predicted to fall by 3.25%, a difference of -26.2TWh over the lifetime of the policy. Using the estimated marginal cost of meeting the renewables target of 8.3p/kWh (2010 prices) the 26.2TWh reduction would come at a cost of £2,158m to replace through other means. This illustrates that the potential impact of reduced deployment would outweigh the cost savings, and result in a large increase in costs to society.

VII. Direct costs and benefits to business calculations

42. The RHI is a voluntary scheme and does not fall under the one-in-one-out rule.

VIII. Wider impacts

1. Competition Impacts

43. There are no clear competition impacts of the proposed policy (option 2) as the RHI is a voluntary scheme.
44. The introduction of air quality requirements (option 2) may lead to innovation in biomass combustion equipment and abatement equipment.

2. Social impacts/ impacts on rural and urban areas

45. Rural areas may be differentially affected by the policy changes introduced under option 2 compared to urban and suburban areas. The RHI emission criteria apply to biomass combustion installations of RHI applicants independent of their geographical location. The air quality benefits, however, will particularly be felt by residents of urban and suburban areas. The policy may help to reduce the difference in exposure to emissions and of the public health burden from low air quality between urban/suburban residents and rural residents.
46. Option 2 has no obvious further impacts on social, wellbeing or health inequalities.

3. Air quality impacts

47. Please refer to section V.2. on benefits of option 2.

4. Carbon Assessment

48. The total impact on carbon savings from option 2 are in line with the overall effect on total renewable heat estimates of the RHI model.(see section V.1.i) point 23.): Relative to the do-nothing option the carbon savings will be changed by very little. Cumulated to 2040, over the entire life span of the policy, the value of additional carbon savings amount to £m12.7, with some years showing positive and some negative carbon savings compared to option 1.