Department of Energy & Climate Change

Renewables Obligation Banding Review for the period 1 April 2013 to 31 March 2017: Government Response to further consultations on solar PV support, biomass affordability and retaining the minimum calorific value requirement in the RO

December 2012

Renewables Obligation Banding Review for the period 1 April 2013 to 31 March 2017: Government response to further consultations on solar PV support, biomass affordability and retaining the minimum calorific value requirement in the Renewables Obligation

Presented to Parliament by the Secretary of State for Energy and Climate Change by command of her Majesty

December 2012

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Executive summary

Introduction

1. The Renewables Obligation (RO) is currently the main financial mechanism by which the Government incentivises deployment of large-scale renewable electricity generation. When it was first introduced in 2002, it offered a single rate of 1 renewables obligation Certificate (ROC) per megawatt hour of eligible renewable electricity generated. Bands of support were introduced in 2009 which allowed the RO to offer varied support levels by technology, reflecting different levelised costs, potential and other factors. Reviews of banding levels were set for every four years.

2. The Government consulted on the levels of banded support for renewable electricity generation for the period 2013-17 between 20 October 2011 and 12 January 2012. On 25 July 2012, the Government's response to the consultation was published which indicated that it would be necessary to re-consult on a number of areas where further engagement with industry and relevant stakeholders was necessary to ensure the right evidence to fully implement the proposals.

3. On 7 September 2012, the Government published two consultation papers setting out proposals for the RO for the period 1 April 2013 to 31 March 2017. One consultation addressed the levels of banded support for solar PV for this period and the other addressed biomass affordability and sustainability.

4. The solar PV consultation proposed to reduce the level of support for new solar PV to 1.5 ROCs/MWh for new accreditations and additional capacity added in 2013/14, with subsequent reductions to 1.3 ROCs for new accreditations and additional capacity added in 2014/15, 1.1 ROCs/MWh in 2015/16 and 0.9 ROCs/MWh in 2016/17. These levels of support were intended to be broadly equivalent to projected tariffs for the largest solar PV FITs band (>250kW-5MW) and to ensure only the most economically-sound solar PV projects were supported. The consultation also proposed to control the costs of solar PV within the RO by using the existing mechanism in article 33 of the Renewables Obligation Order 2009.

5. Part B of the Biomass Affordability Consultation set out three proposals to help ensure the use of biomass under the RO represents value for money for the bill payer. These covered the introduction of a supplier cap to limit the amount of new dedicated biomass power generation (excluding CHP) coming forward between 2013/17, changes to the support for standard co-firing in 2013/14 and 2014/15 and options for the removal of the energy crop uplift.

6. The 25 July Government response to the RO banding review set out our decision to remove the requirement to measure the gross calorific value of fuels, in order to be eligible for the Advanced Fuel band. Since then, we have become aware that this action may allow standard combustion stations to become eligible for support under this band, which was not the policy intention. As a result, we set out our intention to retain the requirement for gaseous fuel produced by means of gasification or pyrolysis to have a gross calorific value (GCV) of 2MJ/m^3 or above in order to be eligible for support under the RO. The intention

was set out in a letter from John Hayes and published on the DECC website on 16 November, in which he invited views.

7. This document is the Government Response to these three consultations and sets out the Government's decisions on these matters.

Responses to the consultation

8. The consultations on solar PV and biomass affordability and value-for-money closed on 19 October 2012. In total 45 responses to the solar PV consultation were received from across the industry including trade associations, developers, installers, manufacturers and financiers. Responses were also received from a few outside the industry including a local authority, an NGO and an individual. In addition there have been a large number of meetings with stakeholders and a significant amount of evidence has been provided.

9. In total 49 responses were received to the biomass affordability consultation. These included responses from electricity suppliers, independent generators and investors, feedstock suppliers, other wood-using industries, NGOs and private individuals. There were a number of meetings with stakeholders and several workshops.

10. The consultation on retaining a minimum gross calorific value requirement in the RO closed on 30 November. There were 24 responses received from across industry and trade associations. These included energy companies, trade associations and a consultant.

11. A summary of the responses to the solar PV and biomass affordability consultations is provided at Annex A and B respectively, and the list of respondents to each consultation can be found at Annex C, D and E. We would like to thank all those who took the time to respond to the consultations.

Solar PV: feedback and decisions

12. A significant majority of respondents (82%) were opposed to the Government's proposal to reduce the level of support for new solar PV from 1 April 2013 to 31 March 2017 as set out in the consultation document. Many respondents also considered that our assessment of the technical deployment potential out to 31 March 2017 was too low. Opinion was generally divided on how best to control the costs of solar PV within the RO. A number of respondents wanted to see a differentiation between the support given to building-mounted and ground-mounted solar PV.

13. **We have decided to move away from the FITs equivalence policy for solar PV under the RO.** At the time of the consultation, limited information was available on the costs of solar PV under the RO; the consultation has provided further information and the Government is now able to set support rates for solar PV under the RO separately from the FITs scheme.

14. **The Government has decided to establish two separate bands for solar PV under the RO: one band for building-mounted solar PV and the other for ground-mounted solar PV.** Although building-mounted solar PV installations can make best use of existing buildings, particularly on a commercial scale, they tend to have a lower load factor because they are constrained by the architecture of the structure (i.e. the pitch of a commercial roof

tends to be flatter than optimal and not all buildings will be orientated in the ideal (south-facing) direction) and therefore require higher levels of support to be able to deploy.

15. For the building-mounted solar PV band, the Government has decided to set the following support levels for new accreditations and for additional capacity during the banding review period (April 2013 to March 2017).

Building-mounted solar PV	**2013/14**	**2014/15**	**2015/16**	**2016/17**
ROCs/MWh	1.7	1.6	1.5	1.4

16. For the ground-mounted solar PV band, the Government has decided to set the following support levels for new accreditations and additional capacity during the banding review period (April 2013 to March 2017).

Ground-mounted solar PV	**2013/14**	**2014/15**	**2015/16**	**2016/17**
ROCs/MWh	1.6	1.4	1.3	1.2

17. These levels of support are higher than those proposed in the consultation and in the majority of years the degression is slower than proposed in the consultation document.

18. **The Government has decided to rely on the mechanisms that already exist under the RO to ensure that support levels for solar PV remain sustainable.** The Government considers that the existing mechanism for early reviews, as set out in article 33 of the Renewables Obligation Order 2009 is the most appropriate tool to use, should it become necessary to do so.

Biomass affordability and value-for-money: feedback and decisions

19. A significant majority of respondents (83%) were opposed to the proposed introduction of a cap on new dedicated biomass power. Concerns were particularly raised regarding the use of a 'supplier cap' to limit the demand for dedicated biomass power Renewable Obligation Certificates (ROCs), as opposed to cap that would limit new generating capacity. Such an approach was expected to lead to new dedicated biomass ROCs being traded at a discount compared to others. However, there was broad agreement (80%) that combined heat and power (CHP) should be outside of the scope of the cap. There was strong agreement that some form of notification process was required to provide the market transparency needed to allow the cap to work as intended, but views differed greatly as to the detail of the process.

20. **The Government has decided to introduce a non-legislative cap, set at 400MW, on the total new build dedicated biomass generating capacity that can expect to be supported at 1.5 ROCs/MWh (or 1.4 ROCS/MWh in the case of full accreditations after 31 March 2016).** Such a cap will not be set in regulation, but once the cap is triggered, Government will consider issuing a consultation paper on proposals to restrict further biomass deployment through the removal of grandfathering rights from additional dedicated biomass power coming forward. Plants that deploy within the 400MW trigger point will be unaffected by any review of grandfathering rights, as will our grandfathering policy towards other renewable technologies under the RO.

21. **The Government has decided that the effective operation of this non-legislative cap will be underpinned by a notification register for new dedicated biomass power plants to be set-up and managed by Ofgem.**

22. **We have also decided biomass CHP Plants will be permanently excluded from the scope of the cap and the notification process when they are first certified, fully or partially, under the CHP Quality Assurance (CHPQA) programme.**

23. Responses to the proposals to reduce the support for standard co-firing and remove the energy crop uplift were very mixed. On balance, the Government has decided to introduce the proposals as we recommended in the consultation. We consider these offer the best combination of controlling the risk of additional RO spend, while ensuring that our policies are collectively aligned with our aim to encourage the move from coal to enhanced co-firing and full conversions.

24. **The Government has decided that support for standard co-firing of biomass and co-firing of regular bioliquids will be reduced to 0.3 ROCs/MWh in 2013/14 and 2014/15. Standard co-firing with CHP and co-firing of regular bioliquids with CHP will be reduced to 0.8 ROCs/MWh in 2013/14 and 2014/15 respectively.**

25. **We have also decided that the energy crop uplift for standard co-firing will be removed, with the exception of existing contracts for energy crops which will be supported until 31 March 2019 or the life of the contract, whichever is earlier.**

Retaining a minimum gross calorific value requirement in the RO: feedback and decisions

26. 95% of respondents supported our intention to make a clear distinction between gasification and standard combustion plants and 70% supported the retention of a minimum GCV requirement of 2MJ/m^3. However, 66% of respondents highlighted the potential technical difficulty or high cost of monitoring the GCV of a fuel gas. 8% of respondents were in favour of distinguishing between gasification and combustion, but felt that a minimum GCV of 2MJ/m^3 was too low, and that a higher value would distinguish gasification stations producing better quality syngas. Some stated that close-coupled gasifiers should not be eligible for the Advanced Fuel band. 16% of respondents did not feel that retaining the minimum GCV requirement was appropriate, and that fuels derived by gasification or pyrolysis could be distinguished by some other means.

27. We consider that without a minimum GCV requirement, there is a risk that standard combustion stations may be eligible for the Advanced Fuel Band. Although stations will face compliance costs, a risk of overcompensation for standard combustion technologies would be prevented. Targeting support at those gaseous fuels produced by means of gasification or pyrolysis which meet the minimum GCV is more in keeping with Government's intention to encourage development towards the production of clean syngas. **We have therefore decided to retain the requirement for gaseous fuel produced by means of gasification or pyrolysis to have a GCV of 2MJ/m^3 or above in order to be eligible for support under the RO.**

Implementation

28. With the exception of the notification process for new dedicated biomass plants, a Renewables Obligation Order giving effect to the whole banding review for England and Wales is to be laid in Parliament in early 2013, and the changes made by that Order are intended to come into force (subject to Parliamentary approval and State aid clearance) on 1 April 2013.

29. The notification process for new dedicated biomass power plants and the criteria for registration are expected to be introduced within a separate Renewables Obligation Order for implementation from October 2013. This would align the timing with the proposed improvements to the sustainability criteria for biomass power and CHP plants.

30. The decisions set out in this document apply to the RO in relation to England and Wales. Decisions regarding the operation of the RO in Scotland and Northern Ireland are for the Scottish Government and Department of Enterprise, Trade and Investment in Northern Ireland respectively. However, the UK Government and the Devolved Administrations understand the benefits of a consistent approach and the importance of this to many within the industry and will seek to provide such consistency across the UK.

Contact details

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1. Solar PV

Introduction

1.1 Solar PV is currently supported under the RO through a single band of 2 ROCs/MWh.

1.2 The solar PV consultation, which ran from 7 September to 19 October 2012, proposed to reduce the level of support for new solar PV to 1.5 ROCs/MWh for new accreditations and additional capacity added in 2013/14, with subsequent reductions to 1.3 ROCs/MWh for new accreditations and additional capacity added in 2014/15, 1.1 ROCs/MWh in 2015/16 and 0.9 ROCs/MWh in 2016/17. These levels of support were intended to be broadly equivalent to projected tariffs for the largest solar PV FITs band (>250kW-5MW) and to ensure only the most economically-sound solar PV projects were supported. The consultation also proposed to control the costs of solar PV within the RO by using the existing mechanism in article 33 of the Renewables Obligation Order 2009.

1.3 The Government identified a gap in the evidence it had on large-scale solar PV. Therefore, the consultation particularly asked for evidence on the generation costs, performance characteristics and deployment potential of large-scale solar PV in the period up to 31 March 2017.

1.4 On 2 October 2012 the Government announced that it had decided to retain the current arrangements which allow new small-scale electricity generating stations (including solar PV) above 50 kW and up to 5 MW in size the option of choosing support from either the RO or the FITs scheme.[1]

Main messages from responses

1.5 A significant majority of respondents (82%) were opposed to the Government's proposal to reduce the level of support for new solar PV from 1 April 2013 to 31 March 2017 as set out in the consultation document. Many respondents also considered that our assessment of the technical deployment potential out to 31 March 2017 was too low. Opinion was generally divided on how best to control the costs of solar PV within the RO. A number of respondents wanted to see a differentiation between the support given to building-mounted and ground-mounted solar PV.

1.6 Points made by responses to the consultation included the following:

- Proposed level of RO support:
  - The proposed support levels would not bring forward much solar PV deployment under the RO.

[1] See the press notice, available at: www.decc.gov.uk/en/content/cms/news/pn12_114/pn12_114.aspx

- The RO is more complex than the FITs scheme and the FITs equivalence policy ignored the fact that the RO and FITs scheme have very different investor risk profiles.
- FITs are structurally more attractive to investors; in comparison ROC electricity and recycle prices are subject to full market risk and uncertainty over the life of the asset.
- Annual degression is justified but it should align with the future path of costs in the sector.

- Controlling the costs of solar PV within the RO:
  - The proposed mechanism offers a reasonable balance between providing sufficient certainty to the industry and the flexibility needed to control costs.
  - There is a need to ensure value for money for electricity consumers.
  - Annual rather than ad hoc reviews would provide some certainty.
  - The proposed mechanism threatens confidence and builds uncertainty into the system.
  - Frequent reviews increase the cost of capital as the investment becomes riskier.
  - There should be a review of both the preliminary accreditation and grace period policy to assist the industry to bring projects forward.

- Economies of scale in >5 MW solar PV projects:
  - Economies of scale exist in relation to component purchasing and project set up costs.
  - Project aggregation can bring efficiencies for management and construction.
  - Price is dependent on the price of raw materials/labour and that supply chain constraints created an upward pressure.

- Additional costs or hurdles associated with large solar PV:
  - Projects can incur disproportionally higher grid connection costs.
  - Supply chain constraints, including long lead times and large deposits for switch gear and other high voltage components affect project development.
  - Obtaining finance for larger more complex projects was difficult and more expensive.
  - Large-scale (>5 MW) solar PV projects are often more complex and sometimes incur additional planning/legal costs.

- Performance characteristics:
  - Solar PV is a truly scalable technology and performance characteristics are nearly identical across all sizes of installation.
  - The key differentiator is not size but type: ground-mounted projects tend to have different performance characteristics to roof-mounted projects, which often have to compromise between orientation and inclination to fit the building.
  - Ground-mounted projects can be orientated for maximum output whereas roof-mounted projects are often deployed in a sub-optimal manner due to architectural constraints.

- Assessment of the deployment potential of large-scale solar PV:
  - The assessment is too low and inconsistent with previous projections for solar PV.
  - Deployment potential forecasts are not based on any meaningful data and are considerably below the ability of the market.

- There is a large potential in both low grade agricultural land and large commercial roofs, provided that best practice in applying planning guidance is followed.
- There are limitations including grid capacity and capacity at electricity substations.
- Deployment rates for large-scale solar PV are very difficult to predict; accurate predictions are not possible.

1.7 **Annex A** provides a more detailed summary of responses to questions posed by the consultation. **Annex C** provides a list of those that responded to the consultation.

1.8 There has, in addition, been a large number of meetings with stakeholders during the consultation period and a significant amount of evidence has been provided. Information was provided on actual project, construction, operational and finance costs as well as technical assumptions.

Post-consultation decisions

FITs equivalence

1.9 **We have decided to move away from the FITs equivalence policy for solar PV under the RO.** The proposed levels of support, as set out in the consultation, were intended to be broadly equivalent to projected tariffs for the largest solar PV FITs band (>250kW-5MW) and modelling done in support of the consultation relied on cost and performance assumptions developed for FITs modelling, in the absence of specific information available relating to costs and deployment of solar PV under the RO. The Government accepts that the two incentive schemes have different risk profiles for investors and, with the availability of the information and further evidence provided in response to the RO consultation, the Government is now able to set support rates for solar PV under the RO separately from the FITs scheme.

Level of support

1.10 **The Government has decided to establish two separate bands for solar PV under the RO. One band for building-mounted solar PV and the other band for ground-mounted solar PV.** The Government is keen to support the most economically-sound solar PV installations, particularly where those installations can be sited on new or existing buildings. Building-mounted solar PV installations tend to have a lower load factor because they are constrained by the architecture of the structure (i.e. the pitch of a commercial roof tends to be flatter than optimal and not all buildings will be oriented in the ideal (south-facing) direction) and therefore require higher levels of support to be able to deploy. Such installations can support commercial businesses in particular, and can generate electricity close to its point of use, reducing call on the grid, having limited additional impact on land use and lowering carbon impacts overall. The electricity demands of large commercial properties tend to match the output of solar closely, as the majority will experience peak demand during working hours.

1.11 **For the building-mounted solar PV band, the Government has therefore decided to set the level of support at 1.7 ROCs/MWh for new accreditations and additional**

capacity added in 2013/14, reducing to 1.6 ROCs/MWh for new accreditations and additional capacity added in 2014/15 and then to 1.5 ROCs/MWh for new accreditations and additional capacity added in 2015/16 and 1.4 ROCs/MWh for new accreditations and additional capacity added in 2016/17.

1.12 **For the ground-mounted solar PV band, the Government has decided to set the level of support at 1.6 ROCs/MWh for new accreditations and additional capacity added in 2013/14, reducing to 1.4 ROCs/MWh for new accreditations and additional capacity added in 2014/15, 1.3 ROCs/MWh for new accreditations and additional capacity added in 2015/16 and 1.2 ROCs/MWh for new accreditations and additional capacity added in 2016/17.**

1.13 These levels of support are intended to encourage slow but steady deployment. Such rates are designed to bring on the most economically-sound solar PV projects under the RO. The Government considers that these rates strike the right balance between supporting the solar PV industry under the RO and the need to ensure value for money for consumers.

1.14 These levels of support are higher, and thereafter in all but one year the degression is slower, than proposed in the consultation document. Although the costs of solar PV have fallen dramatically in the past, many consultation responses did not consider that costs would continue to fall at such a rate. The slower degression is therefore more in line with the current predictions of the future path of costs in the sector. Setting support at 1.6 rather than 1.5 ROCs/MWh in the ground-mounted band during 2013/14 creates a 0.2 ROCs degression for the following year. We do however consider it appropriate to implement a gentler step down in support (i.e. to 1.6ROCs instead of 1.5) from the current 2 ROCs/MWh, as a transition towards the further reductions in each of the last three years of the banding review period.

Assumptions

1.15 The solar PV bands will be available to solar PV above 50kW in size. The Government identified a particular gap in its evidence on large scale solar PV and a large amount of evidence has been provided from consultees in response on the generation costs, performance characteristics and deployment potential of large-scale solar PV in the UK. While the majority of consultation responses related to ground-mounted solar, we have received evidence on building-mounted projects which points to the need for higher support rates to incentivize the most cost-effective installations. The accompanying impact assessment contains a detailed overview of the resulting changes that have been made to the assumptions and sensitivities that underpin the modelling of the support rates for solar PV under the RO.

1.16 Table 1 below sets out some of the key assumptions used during the consultation along with changes made in respect of both large-scale ground-mounted (>5 MW) and building-mounted (>250 kW) solar PV.

Table 1: Key assumptions used in the consultation and post-consultation

Variable	Unit	Consultation value	Revised Value Ground-mounted	Revised Value Building-mounted[2]
Capital cost (capex) of 2013-14 installation	£/kW, 2012 prices	**1053**	**1140**	**1038**
Annual O&M cost of 2013-14 installation	£/kW, 2012 prices	**22**	**24**	**27**
Load factor	kWh/kW/yr	**850**	**975**	**850**
Degradation	%/yr	**-**	**0.5**	**0.5**
Technology lifetime	yrs	**35**	**25**	**25**
Capex learning rate	%/yr	***See below***		
Technical deployment potential to 31 March 2017	Accumulated MW	***See below***		
Hurdle rate	Pre-tax real	**7.5**	**7.5**	**7.5**[3]

Costs

1.17 Further to the evidence submitted by the industry, the Government has revised the values that it attributes to capital cost and annual cost of operation and maintenance to reflect the costs associated with developing, building and operating large-scale solar PV installations in the UK. A significant factor in the difference in capex figures for ground-mounted and building-mounted solar PV would appear to be grid connection costs, which do not tend to apply to building-mounted solar PV.

[2] In modelling uptake and deployment of building-mounted solar PV we have used assumptions in the FITs model. For details see: www.decc.gov.uk/assets/decc/11/consultation/fits-comp-review-p1/3365-updates-to-fits-model-doc.pdf; www.decc.gov.uk/assets/decc/11/meeting-energy-demand/renewable-energy/5381-solar-pv-cost-update.pdf and www.decc.gov.uk/assets/decc/11/meeting-energy-demand/renewable-energy/5391-impact-assessment-government-response-to-consulta.pdf. The assumptions in this table have informed the setting of support rates for building-mounted PV.

[3] In modelling uptake and deployment of building-mounted solar PV we have used the FITs hurdle rate assumptions. For details see: www.decc.gov.uk/assets/decc/11/meeting-energy-demand/renewable-energy/5391-impact-assessment-government-response-to-consulta.pdf

1.18 It is important to note that lease costs and costs associated with developing other infrastructure (such as creating road access or constructing a building) have been excluded for consistency purposes from our modelling. These costs are not considered in relation to other renewable technologies.

Load Factor

1.19 In the consultation document we assumed a load factor of 850 kWh/kW/yr, which had originated from work undertaken for the FITs review. During the consultation exercise, many respondents indicated that this load factor was too low and not a true reflection of likely yields available for large-scale ground-mounted solar PV in the UK. Those that provided information on this reflected a load factor range of between 850-1250 kWh/kW/yr, with the majority of respondents suggesting a load factor of 960 kWh/kW/yr or more. The Government has reviewed the evidence and agrees that the assumed load factor for large-scale ground-mounted solar PV should be increased.

1.20 We have increased the load factor assumption for large-scale ground-mounted solar PV from a representative value for the country as a whole (equivalent to a building-mounted project in Sheffield) to something more consistent with a ground-mounted project in the southern regions of the UK. This is consistent with our approach to bring on the most economically sound solar PV projects under the RO. Evidence suggests that in the southern regions of the UK, levels of irradiation are considerably higher than in the northern regions and therefore the load factors achievable by large-scale ground-mounted installations are also likely to be significantly higher.[4] Additional evidence also suggests that the system average performance ratio is now over 80% (this is 5% higher than referenced within these irradiation maps).[5] Developments that can employ optimisation techniques (not all will be able to install tracking) are likely to be able to obtain even higher load factors (an increase in annual energy yield of up to 37%).[6]

1.21 The Government has therefore decided to increase the load factor assumption for ground-mounted solar PV to 975 kWh/kW/yr (under central assumptions) to reflect the higher load factors that can be expected from ground-mounted installations that are (or are likely to be) located mainly in the southern parts of the UK.

1.22 Information received through the consultation indicated that load factors for building-mounted installations tend to be lower than for ground-mounted installations. This is because building-mounted projects have limited freedom to optimize the tilt and orientation of panels in order to maximize output. There is a good deal of uncertainty as to what the appropriate load factor assumption for building-mounted projects is, given wide variations in roof angle and orientation. In light of uncertainty about the appropriate load factor for building-mounted installations, the assumed load factor remains 850 kWh/kW/yr for this type of installation.

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[4] PVGIS © European Union, 2001-2012. http://re.jrc.ec.europa.eu/pvgis/cmaps/eur.htm#GB

[5] Microgeneration Database, Report 15, August 2012, The Sheffield Solar Farm. See: www.microgen-database.org.uk/uploads/6b/1e/6b1ecec069f49b16e3b17b88170992ca/report_201208.pdf

[6] Utility Scale solar power plants: A guide to developers and investors, International Financial Corporation, February 2012. http://www1.ifc.org/wps/wcm/connect/04b38b804a178f13b377ffdd29332b51/SOLAR%2BGUIDE%2BBOOK.pdf?MOD=AJPERES.

1.23 The degradation of solar PV panels over time was not something that was included within our original modelling. The load factor assumptions for both large-scale ground-mounted and building-mounted solar PV now include an annual 0.5% rate of panel degradation which is consistent with the warranties available from manufacturers.

Technology Lifetime

1.24 Further to discussions with a variety of different stakeholders the Government has reduced the technology lifetime in the model from 35 to 25 years to reflect the investment time horizon. 25 years is also the length of time for which large-scale ground-mounted solar PV projects are usually granted planning permission.

Capex Learning Rate

1.25 The Government has decided to use an alternative projection to reflect the widely held view that a reduction in capex of 10% between 2012-13 and 2013-14 (as assumed in the consultation) is unlikely to occur. Table 2 below sets out the reduction in capex compared to the previous year (%) that underpinned the modelling in the consultation and the reduction underpinning the modelling in this Government Response.

Table 2: Reduction in capex compared to previous year

	2013-14	2014-15	2015-16	2016-17
Consultation	**-10%**	**-4%**	**-4%**	**-4%**
Government response	**-7%**	**-6%**	**-5%**	**-5%**

1.26 The revised projection assumes a 7% reduction in capex in 2013-14 rather than 10%. The capex learning rate is an important assumption for determining the annual degression of the ROC rate.

Technical Deployment Potential

1.27 Estimates of the technical deployment potential for solar PV are very uncertain, as reflected in the wide range of values provided in responses to the consultation. The level of deployment will depend on a variety of factors including the opportunity cost of using land and grid constraints (for ground-mounted installations) and planning constraints (for building-mounted installations).

1.28 The assumption for technical deployment of small-scale solar PV is that used in the FITs model.[7] In light of the RO consultation, we have reviewed our methodology for determining the technical deployment potential for large-scale ground-mounted solar PV in the UK under the RO to 31 March 2017. As a result, our assessment has increased from 720 MW

[7] For more details see www.decc.gov.uk/assets/decc/11/consultation/fits-comp-review-p1/3365-updates-to-fits-model-doc.pdf.

to 4.6 GW. **It is important to note that 4.6 GW is not a deployment target for large-scale ground-mounted solar PV under the RO, it is merely a modelling assumption for the maximum technical deployment potential of large-scale ground-mounted solar PV in the UK in this period.**

1.29 We believe the best approach to estimating the technical potential deployment of large-scale ground-mounted solar PV is by understanding the physical constraint of it on the current UK electricity grid network and to consider whether 22 GW by 2020 (that had previously been considered in relation to the FITs scheme) could be accommodated on the system. The system operator, National Grid, has undertaken new modelling which considers the impacts of solar PV on Great Britain's transmission system operation for the year 2020. National Grid's initial estimate shows that deploying more than 10 GW of solar PV would make balancing the existing grid infrastructure significantly more challenging in its current form.[8]

1.30 Although about 22 GW of solar PV could theoretically be accommodated on the system it is dependent on a number of conditions (including interconnection and export capacity, the availability of electricity storage, the amount of on-site usage, the range of possible changes to the generation mix, the level and nature of demand and necessary infrastructure modifications for transmission and distribution networks). We have however reduced this maximum by 10% due to the uncertainty associated with the underlying conditions and the ability to forecast this limit out to 2020. We therefore consider 20 GW of solar PV (both large- and small-scale) to be the theoretical technical maximum that can be accommodated on the grid by 2020 (subject to the potential conditions set out above).

1.31 We have examined the modelling and trajectory undertaken for the recent small-scale FITs review (which includes deployment of building-mounted solar PV) and calculated an approximate glide path to 20 GW by 2020 for solar PV (both small- and large-scale installations) in order to determine the maximum technical deployment potential of large-scale ground-mounted solar PV. We estimate that by the end of the RO banding review period in March 2017 the total maximum amount of solar PV on the UK electricity grid (consistent with a theoretical technical maximum of 20 GW in 2020) would be 11.3 GW.

1.32 Assuming there would be 6.7 GW of small-scale solar PV deployment, which includes large-scale building-mounted installations (as projected in the FITs central deployment scenario), then there would be room on the system for up to 4.6 GW of large-scale ground-mounted solar PV.

1.33 This total maximum level (11.3 GW) of solar PV generation on the system is above the 10 GW in 2020 threshold, where National Grid predicts the onset of curtailment issues and inflexible generator scheduling problems would start to occur during the summer minima. However, National Grid's assumptions are based on 2020 (rather than 2017) levels of build-out of other renewables and 10 GW is not a hard limit. It is therefore possible to assume that with a background generation mix on the electricity system in 2017, the total maximum of 11.3 GW can be accommodated.

[8] National Grid (2012), Solar PV briefing note for DECC.

Hurdle Rate

1.34 There has not been sufficient evidence submitted to change our assumption that a pre-tax real hurdle rate of 7.5% for large-scale solar PV is appropriate to bring forward only the most economically sound solar PV projects under the RO.

Controlling the costs of solar PV within the RO

1.35 **The Government has decided to rely on the mechanisms that already exist under the RO to ensure that support levels for solar PV remain sustainable.** The Government considers that the existing mechanism for early reviews, as set out in article 33 of the Renewables Obligation Order 2009 is the most appropriate tool to use, should it become necessary to do so, to ensure that any future changes in the industry do not lead to windfall gains for developers and put pressure on the RO budget.

1.36 Long-term projections of costs in the solar PV sector are very difficult to make. The Government takes the potential risks to the Levy Control Framework and the RO budget very seriously and needs to be able to respond to market changes as quickly as possible. While the Government will continue to monitor the industry very closely and consider holding an early review if there is evidence that the legal criteria for an early review are met, there is no desire to have regular or systematic reviews of solar PV.

1.37 It is recognised that early reviews create market uncertainty. It is, however, important to note that reviews can only be triggered by situations which fulfil the criteria set out in article 33(3) of the legislation. We are not proposing a change to the existing legislative triggers for an early review and any changes to banding levels proposed by an early review would be subject to consultation.

1.38 The early review powers in article 33 apply to all renewable energy technologies that receive support under the RO and there is no justification to treat the solar PV sector differently. Likewise we do not intend to make specific changes to grandfather support at the preliminary accreditation stage for solar PV. Preliminary accreditation in the RO is designed to give generators of renewable energy more certainty about future accreditation before making major financial commitments rather than provide any guarantee of a particular support rate.

1.39 The Government also does not intend to make specific changes in relation to solar PV to the grace period policy which we announced in the response to the RO banding review consultation in July.[9] Solar PV stations accredited from 1 April 2013 to 30 September 2013 may be able to register as a grace period generating station if they can provide the evidence required and meet all of the relevant conditions. Grandfathering, the tool we apply to maintain a fixed level of support for the full lifetime of a generating capacity's eligibility for the RO, from the point of accreditation of that capacity – will continue to apply to solar PV projects.

[9] See: www.decc.gov.uk/en/content/cms/consultations/cons_ro_review/cons_ro_review.aspx

1.40 It is important that the Government has up to date information about potential large scale solar PV projects and when they are likely to commission under the RO. This will assist in setting the obligation each year for the number of ROCs that suppliers must submit. It will also help to give early warning of whether the triggers for an early review are met. Therefore, the Government may in the future look to introduce a mandatory notification process for solar PV projects intending to accredit under the RO.

Other issues

1.41 A small number of responses to the consultation encouraged the Government to develop 'sustainability criteria' in relation to the deployment of large-scale ground-mounted solar PV and land use. While the Government does not propose to include any such criteria in the RO, it will work with others to look at the issue in more detail and encourage best practice.

2. Biomass affordability and value-for-money

Introduction

2.1 Biomass is expected to make a significant contribution to delivering the UK's 15% renewable energy target in 2020, with roles across transport, heat and electricity. As we set out in the UK Bioenergy Strategy[10], it is essential that our policies reflect four core principles; that bioenergy should deliver real greenhouse gas savings; be cost-effective; take account of wider impacts across the economy; and manage possible risks such as to food security and biodiversity.

2.2 Moreover, as we said in the Government Response to the RO Banding Review consultation[11], published in July, Government's intention is to focus on the lower cost, transitional biomass power technologies, where coal used in existing power plants is replaced by biomass through enhanced co-firing capability(above 50% biomass input by energy content) and in full conversion to biomass.

2.3 We need to think carefully about how we support the use of biomass under the RO and ensure this represents value for money for the bill payer, with the overall budget remaining within the levy control framework. Therefore in the follow-up RO Banding Review Consultation, that covered biomass affordability[12] we set out 3 proposals to achieve this: reductions in the support for standard co-firing in 2013/14 and 2014/15; options for the removal of the energy crop uplift for standard co-firing; and the introduction of a supplier cap to limit the amount of new dedicated biomass power generation coming forward between 2013/17. We proposed that the cap would exclude good quality CHP and could be underpinned by a notification process.

Main messages from responses

2.4 Though the 49 responses differed in their focus, there were some clear areas of agreement either within one group of stakeholders, or in the case of the CHP proposal, across different groups:

- Industry respondents were strongly opposed to the proposed introduction of a 'supplier cap' on new dedicated biomass power that would work through limiting the

[10] DECC, Defra & DfT (April 2012) UK Bioenergy Strategy
www.decc.gov.uk/en/content/cms/meeting_energy/bioenergy/strategy/strategy.aspx
[11] DECC (July 2012) Government response to the consultation on proposals for the levels of banded support under the Renewables Obligation for the period 2013-17
www.decc.gov.uk/en/content/cms/consultations/cons_ro_review/cons_ro_review.aspx
[12] DECC (September 2012) Biomass Electricity & CHP plants – ensuring sustainability and affordability
www.decc.gov.uk/en/content/cms/consultations/biomass_ro/biomass_ro.aspx

potential demand for the large power utilities (i.e. UK electricity suppliers to business and households) to buy the resulting ROCs.

- They were concerned that under such a supplier cap, new dedicated biomass power ROCs would trade at a significant discount to conventional ROCs, and independent generators would be unable to access a Power Purchase Agreement (PPA).
- However, a majority of industry responses considered that if a cap had to be introduced, the control should be applied at the total new generating capacity level to avoid these issues.
- Many industry respondents also agreed that an efficient, effective and transparent notification process would be essential to making a cap work effectively. However, opinions as to the most appropriate point for a project to notify, and the evidence that would be required to be provided in order to join the notification register, varied significantly.
- Some NGOs welcomed a restriction on new dedicated biomass, but preferred a tighter cap, ideally set to zero. Their view was that biomass would be better used in CHP, heat or non-energy uses because of the higher potential GHG benefits.
- There was broad agreement across all stakeholders that CHP should be outside of the cap, to encourage heat capture and use wherever feasible. But CHP developers were concerned by the proposed annual CHPQA accreditation requirement.
- Some industry respondents were disappointed by the proposed reduction in the support for standard co-firing in the first 2 years. Several stated this would lead to permanent reductions in the levels of standard co-firing at their plants, due to the break in contracts or loss of support infrastructure.
- Views on the preferred approach for removing the energy crop uplift were mixed. Some argued that the removal of the uplift would lead to the loss of the UK embryonic supply chain for energy crops. Others considered that its removal would be acceptable providing that the chosen method retained a level playing field for all generators.

2.5 **Annex B** provides a more detailed summary of responses to questions posed by the consultation. **Annex D** provides a list of those that responded to the consultation.

Post-consultation decisions

New build dedicated biomass cap

2.6 **We have decided against the introduction of a 'supplier cap', and will instead introduce a cap based on generating capacity for new dedicated biomass.** We recognise that a cap that works by potentially restricting demand from ROC buyers (electricity suppliers to household and business customers), could lead to new dedicated biomass ROCs being traded at a discount to ordinary ROCs. Similarly, such a cap could make it difficult for new dedicated biomass projects to obtain a power purchase agreement (PPA) with an electricity supplier. Therefore, in light of the consultation feedback and accompanying evidence, we have decided to adopt a cap based on total new build generating capacity. This should not only avoid the risk of discounted ROCs, but should also be easier for the bioenergy industry to incorporate in their decision-making when developing new generating plant or setting their procurement plans for ROCs.

2.7 We considered putting the generation-based cap into the legislation for the RO, but concluded that the same policy outcome could be achieved through a non-legislative

approach. **Government has decided to introduce a non-legislative cap on the total new build dedicated biomass generating capacity that can expect to be supported at 1.5 ROCs/MWh (or 1.4 ROCS/MWh in the case of full accreditations after 31 March 2016).** Once the cap is triggered, Government will consider issuing a consultation paper on proposals to restrict further new build dedicated biomass deployment by excluding from grandfathering any further new build dedicated biomass generating capacity coming forward.

2.8 **The trigger level for this consultation would occur when 400MW of new dedicated biomass generating capacity is added to a notification register that would be administered by Ofgem.** The notification process and the criteria for registration would be set out in the legislation for the RO.

2.9 **Plants on the notification register before the 400MW trigger is hit will not be affected by a possible consultation on grandfathering rights.** These projects will be eligible to apply for full accreditation and to be grandfathered at the ROC levels applicable at the time of their full accreditation. Therefore these projects, once on the register and knowing that they are within the 400MW limit, will be able to progress with confidence and certainty.

2.10 We consider that our decision delivers a proportionate approach which will robustly limit new dedicated biomass deployment coming forward under the RO. Our chosen approach does not affect our policy towards the principles of grandfathering; stations that are on the notification register within the 400MW cap will receive the ROC rate applicable at the point of full accreditation, and our grandfathering policy means that the ROC rate will not be affected by any subsequent reviews. **Nor does this decision affect our grandfathering policy towards other renewables technologies under the RO.**

2.11 What our decision does mean, however, is that any possible projects not sufficiently advanced to have already joined the notification register when the 400 MW trigger point is reached, would need to factor in possible future changes to ROC support levels that could be applied following their accreditation, in deciding whether to proceed further.

2.12 Our chosen approach is intended to provide a similar level of investor certainty, regarding the amount of new generating capacity that will be supported under the RO, as would a generating capacity cap introduced through legislation. As with our original proposal, we aim to enable those projects that are shovel-ready, or closest to this, to come forward under the RO.

2.13 Modelling undertaken for the Government Response to the RO Banding Review Consultation Impact Assessment suggested approximately 300MW of new build dedicated biomass plant capacity would be brought forward at the proposed level of RO support by 2017. However, the latest available pipeline data suggests the level of high probability projects is now a little under 250MW in total, increasing to 560MW when both high and medium probability projects are included in the estimate. Therefore the trigger is being set at 400MW to allow all the high probability shovel-ready projects to come forward, and to leave headroom for some of the medium probability smaller projects to progress under the RO. Larger projects that are not yet shovel ready may consider coming in under the Contracts for Difference (CfD) support mechanism instead of the RO.

2.14 As an alternative approach, we considered whether we could be ready to instigate an early review of ROC rates, should more projects enter the notification register than we expect or have budget to support. However, the criteria under which a review can take place are laid down in Article 33 of the Renewables Obligation Order 2009; we cannot guarantee that one of the criteria would be triggered in order for us to use this process.

Exemption for combined heat and power (CHP)

2.15 **We have decided that the non-legislative cap and the notification process will not apply to new dedicated biomass CHP plants that achieve certification under the UK's CHP Quality Assurance (CHPQA) programme. Stations that achieve full or partial CHPQA certification will be permanently exempted and would not be affected by the possible review of grandfathering rights triggered when 400MW of new dedicated biomass power has been put on the notification register.**

2.16 As is currently the situation for those seeking the CHP Uplift under the RO, generators seeking CHPQA certification will provide information to the CHPQA Programme Manager who will assess their application and inform Ofgem whether or not the plant complies with CHPQA. **For the purpose of the cap exemption, CHPQA assessment will only need to take place once**. There will be no need to reconfirm that position every year to remain outside the new dedicated biomass cap following the first successful CHPQA certification.

2.17 Concerns were raised that a CHP plant could lose heat customers through no fault of its own and then become subject to the cap. Such a process would make monitoring and management of the cap difficult for both industry and Government. It would also raise the level of uncertainty for a dedicated biomass plant developer as to whether to proceed with their project**. Therefore, we have decided that once the plant has demonstrated to Ofgem that it is CHPQA certified the exemption will remain available even if the station subsequently loses its certification**. It is also our intention that the exemption would continue to apply whether the plant had been receiving support for its heat through the CHP uplift under the RO, or through the Renewable Heat Incentive (RHI). The one exception would be if the station should never have been CHPQA certified in the first place, for example, in the case of fraudulent applications for CHPQA.

2.18 Concerns were also raised as to how we would treat CHP stations with only partial certification. This can arise if stations have a business plan which is based on a gradual increase in heat offtake, starting from a low base, or if a station loses one of its heat customers such that only part of the CHP station meets the qualifying criteria. We recognise that it can take time to establish a network of heat customers. **Therefore we have decided to exempt the entire station, whether full or partially certified, from the cap**. As with our decision on the CHPQA assessment, this provides additional certainty and clarity for the CHP plant developer, for the notification register and the cap more widely.

2.19 We considered the risk that dedicated biomass generators could decide to claim CHPQA, in order to be exempt from the cap and then decide not to be CHP in practice. However, the current process for determining CHPQA requires provision of evidence of heat customers, a 5-year business plan and a process design which can meet that business case. Therefore we consider existing CHPQA procedures in combination with the proviso set out in paragraph 2.17 will be sufficient to ensure that the stations receiving CHPQA certification are genuine CHP projects.

2.20 In addition, we will be consulting on changes to the CHPQA certification requirements to reflect improvements in the efficiency of such schemes since the CHPQA criteria were first developed.

2.21 **We have decided to exclude generators at 50 kWe or less declared net capacity from the scope of the cap and from the notification register**. There is a similar exemption for microgenerators under the bioliquid cap. Energy-from-waste CHP, landfill gas, sewage gas, the advanced conversion technologies (gasification & pyrolysis) and anaerobic digestion are also excluded from the cap and notification register. Bioliquids are excluded from the new dedicated biomass cap as these are subject to their own separate RO cap to limit their use.

Notification process for new projects

2.22 **We have decided that a notification process will be introduced to provide information to Government and the market on new dedicated biomass projects coming forward. From the date of its introduction, only new dedicated biomass projects that are on the notification register at the point of full accreditation will be eligible for support under the dedicated biomass band (1.5 ROCs/MWh to 31 March 2016, then 1.4 ROCs/MWh) under the RO.** Failure to notify would mean that the new plant would be eligible for support under the default rate of 1 ROC/MWh support if only biomass feedstocks are used during a particular month, or the appropriate lower co-firing rate if fossil fuel is used together with biomass.

2.23 We expect developers will seek to join the notification register promptly, in order to be confident that their proposed plant is within the 400MW trigger point, and will be unaffected by any review of grandfathering rights. However, providing a clear and accurate picture of projects coming forward is essential to enable developers, investors and Government to know what is in the pipeline, and if or when action could be taken. **Therefore we have decided to make the notification process mandatory with respect to benefiting from the 1.5/1.4 ROC rate to further ensure that the register is complete and accurate.** Eligibility to join the register will be based on supplying specified formal documentation to Ofgem as evidence that final investment decision has been reached. Once satisfied, Ofgem will place information on its website similar to that currently published in the Renewable Energy Planning Database together with information on the expected commissioning/approval date and the running total of notified capacity.

2.24 It will be essential that the documentation required as part of the notification process is sufficient to differentiate between projects that are ‘shovel-ready’ i.e. well-advanced, and are expected to start construction shortly, and projects that are at an earlier stage of consideration. If we did not take this approach, we would risk the register being filled with projects that have a relatively low chance of being realised under the RO, which could then act as a barrier to the genuine ‘shovel-ready’ projects progressing to completion. **Government will engage with industry and other stakeholders, early in 2013, to help ensure that the specified information requirements and registration criteria achieve these aims**.

2.25 Following resolution on the detail of the information requirements, we will introduce the notification process for new dedicated biomass generating stations through changes to the

RO Order. We intend to bring these changes into force from 1 October 2013, which is also the date proposed for implementing the biomass sustainability changes, such as the proposals for tightening the GHG emissions targets for new dedicated biomass power plants to help ensure value-for-money.

Standard co-firing of biomass, co-firing of bioliquids and standard co-firing with CHP

2.26 **We have decided that support levels for standard co-firing of biomass and co-firing of regular bioliquids will be reduced to 0.3 ROCs/MWh in 2013/14 and 2014/15, and standard co-firing with CHP and co-firing of regular bioliquids with CHP will be reduced to 0.8 ROCs/MWh for all stations in 2013/14 and 2014/15. Support levels for standard co-firing of biomass and co-firing of regular bioliquids will increase back to 0.5 ROCs/MWh for all stations in 2015/16 and 2016/17. Likewise, support levels for all stations eligible for standard co-firing with CHP and co-firing of regular bioliquids with CHP will increase back to 1 ROC/MWh in 2015/16 and 2016/17.** This will provide greater certainty that the cost of the RO will remain within budget, particularly over the first two years of the banding review period when the pressure on the Levy Control Framework is greatest. This is the proposal as set out in the consultation.

2.27 We recognise the impact of our decision may be that we see little or no standard co-firing of biomass over the period 2013/14 to 2014/15, but this is necessary in order to ensure the RO remains within budget. Moreover, we acknowledge that standard co-firing at some plants, once interrupted, may not resume again from 2015/16. However, our decision reflects both our intention to encourage existing coal stations to invest in full conversion and enhanced co-firing and that these two technologies alone could deliver a significant contribution to the renewable generation needed to meet the 2020 target.

2.28 Changes in the level of support for standard co-firing will also affect the levels of support for co-firing of regular bioliquids and for standard co-firing with CHP. As set out in our Government Response to the Banding Review, regular bioliquids will not be eligible for support under the enhanced co-firing bands. Co-firing of regular bioliquids is therefore supported at the same level as the standard co-firing band, whatever the proportion of biomass combusted in the unit. **Therefore, under this decision, co-firing of regular bioliquids will also see its support fall in line with the reduction in support for standard co-firing; i.e. lowering to 0.3 ROCs/MWh in 2013/14 and 2014/15, increasing back to 0.5 ROCs/MWh from 2015/16**.

2.29 **Under this decision, standard co-firing with CHP will also receive a lower level of support of 0.8 ROCs/MWh in 2013/14 and 2014/15 or 0.3 ROCs/MWh plus the appropriate RHI**. As we announced in July, the standard co-firing with CHP band will be closed to new entrants from 1 April 2015 (except in those cases where the new generating capacity is ineligible for the RHI). Based on our modelling analysis, at these support levels, we are expecting very little standard co-firing with CHP or co-firing of regular bioliquids to come forward during 2013/17 under the RO.

2.30 The reduction in the support level for standard co-firing with biomass will also have an impact on the level of support for standard co-firing with energy crops, as set out below.

Removal of energy crop uplift for standard co-firing

2.31 **We have decided that the energy crop uplift for standard co-firing will be removed, with the exception of electricity generated using energy crops supplied under existing contracts where the uplift will remain available until 31 March 2019 or the life of the contract, whichever is earlier.** This decision applies to co-firing plants with or without CHP. This option provides the best combination of controlling possible new spend on large-scale energy crops, while recognising existing investment in the energy crop supply chain and providing consistency of treatment across different levels of co-firing.

2.32 In the Government Response to the Banding Review published in July we set out our intention to not provide the energy crop uplift to biomass conversions and enhanced co-firing. We recognised that in doing so, this established an anomaly since standard co-firing could still receive the uplift of 0.5 ROCs if an eligible energy crop were used. This could lead to a situation where standard co-firing with energy crops was rewarded with a higher level of support than mid-range and high range co-firing (enhanced co-firing is rewarded with 0.6 – 0.9 ROCs/MWh). In order to take a consistent approach to all co-firing bands, and limit the future potential costs to energy consumers, we proposed to bring the uplift for the standard co-firing band to an end. Recognising the impact this could have on investment in the energy crop supply chain, we consulted on three proposals that could help protect this investment:

- Maintain the energy crop uplift for existing energy crop contracts only until 2019 (our preferred approach);
- Retain the energy crop uplift in standard co-firing until 2019 only for generating stations who are already claiming the energy crop uplift;
- Retain the energy crop uplift in standard co-firing until 2019 for all generating stations.

2.33 We understand that the decision to retain the uplift only for existing contracts will impose some additional costs both on those generators claiming the uplift and on Ofgem. However, the other two proposals were considered to pose unacceptable risks to the RO budget or to the market operating as a level playing field. Some generators who currently co-fire, but do not use energy crops, stated that at an incentive level of 0.3 ROCs/MWh they would expect to cease their co-firing activities in 2013 as the reduced support would make this uneconomic. However, 0.8 ROCs/MWh for co-firing with an energy crop (i.e. 0.3 ROCs plus the 0.5 ROCs energy crop uplift) could provide sufficient incentive if a lower cost energy crop were sourced, and this could allow some of their co-firing activity to continue. Therefore these respondents opposed the proposal that would retain the option of uplift for existing users of energy crops but not for themselves.

2.34 We were concerned that allowing only co-firing generating stations already claiming the energy crop to continue to claim the uplift, without imposing restrictions on future expansion, risked providing these stations with a comparative advantage above the rest of the market. But if we were to allow all co-firing generating stations to access the energy crop uplift this could expose the RO to significant unplanned spend on generation using large volumes of imported energy crops. We also looked at setting a cap on the use of energy crops on a per generator or per generating station basis, but concluded that this would be complicated to administer.

2.35 We value the investment that several UK generators have made in developing a domestic energy crop supply-chain. Their endeavours have generated local business and job opportunities and provided some increased energy security benefits for the UK. However, the UK's total production of perennial energy crops remains small. Some of the behavioural barriers – such as resistance to the need to commit UK farmland for around 7 years when deciding to grow energy crops - are proving extremely challenging to overcome. As a consequence, the number of energy crops contracts that are currently in place is limited.

2.36 With our chosen approach, we expect the majority of these existing energy crops contracts will come to their expected end before 31 March 2019. By setting this as the final cut off date for support under the RO energy crop uplift, we have allowed for, in the UK's temperate climate, one cycle of energy crop planting of Miscanthus Grass, followed by 4 years of harvesting.

3. Retaining a minimum gross calorific value requirement in the RO

Introduction

3.1 The Government Response to the RO banding review, published in July, set out our decision to remove the requirement to measure the gross calorific value of fuels, in order to be eligible for the Advanced Fuel band. Since then, we have become aware that this action may allow standard combustion stations to become eligible for support under this band, which was not the policy intention. As a result, DECC set out its intention to retain the requirement for gaseous fuel produced by means of gasification or pyrolysis to have a gross calorific value (GCV) of 2MJ/m^3 or above in order to be eligible for support under the RO.

Main messages from responses

3.2 Out of 24 responses, 23 supported our intention to make a clear distinction between gasification and standard combustion plants. 17 responses supported the retention of a minimum GCV requirement of 2MJ/m^3. However, 16 respondents highlighted the potential technical difficulty or high cost of monitoring the GCV of a fuel gas.

3.3 2 respondents were in favour of distinguishing between gasification and combustion, but felt that a minimum GCV of 2MJ/m^3 was too low, and that a higher value would distinguish gasification stations producing better quality syngas. Some stated that close-coupled gasifiers should not be eligible for the Advanced Fuel band.

3.4 4 respondents did not feel that retaining the minimum GCV requirement was appropriate, and that fuels derived by gasification or pyrolysis could be distinguished by some other means.

3.5 **Annex E** provides a list of those that responded to the consultation.

Post-consultation decisions

3.6 We consider that without a minimum GCV requirement, there is a risk that standard combustion stations may be eligible for the Advanced Fuel Band. Although stations will face compliance costs, a risk of overcompensation for standard combustion technologies would be prevented. Targeting support at those gaseous fuels produced by means of gasification or pyrolysis which meet the minimum GCV is more in keeping with Government's intention to encourage development towards the production of clean syngas. **We have therefore decided to retain the requirement for gaseous fuel produced by means of gasification or pyrolysis to have a GCV of 2MJ/m^3 or above in order to be eligible for support under the RO.**

3.7 A majority of respondents were concerned about the technical difficulty of directly measuring the GCV of a fuel gas on a continuous basis. The RO Order does not explicitly require continuous monitoring, and there is scope for companies to propose alternative methods such as regular sampling, or modelling of other factors to demonstrate that the GCV of the fuel gas is above 2MJ/m^3 backed up by periodic sampling data. Industry is in discussions with Ofgem to find acceptable alternative approaches.

3.8 Some respondents argued that there should be a distinction and higher level of support for those gasifiers who are producing a higher quality syngas, such as those suitable for combustion engines. Costs collected as part of the banding review showed that all ACT technologies required at least 2 ROCs/MWh, so the decision was taken to support all new ACT generating stations under a single band. Those who sought an increase in the minimum GCV requirement higher than 2MJ/m^3 would narrow the eligibility for the Advanced Fuel band compared to the current eligibility for the gasification and pyrolysis bands. This would be a deviation from the intended policy for ACTs as set out in the Banding Review Government Response. We do not therefore think it appropriate to raise the minimum GCV value above 2MJ/m^3 at this time.

3.9 A number of alternative approaches to define the eligibility of the Advanced Fuel band were considered during the course of the banding review. Other methods considered were practically difficult or costly to administer, and therefore did not confer an advantage over the current definitions. As stated in the Banding Review Government Response, although we have concluded that it is currently too early in the maturation stage of the industry to treat technologies differently, we expect that any further assessment of ACTs would be undertaken in the context of the Electricity Market Reform (EMR) programme. The Government will work with stakeholders to ensure that ACTs are defined in such a way as to incentivise further cost-effective deployment of the most innovative, efficient and renewable generation under the EMR Contracts for Difference regime.

Annex A: Summary of solar PV responses

1. In total 45 responses were received from across the industry including trade associations, developers, installers, manufacturers and financiers. Responses were also received from a few outside the industry including a local authority, a NGO, and an individual. In addition, there were 28 different meetings with stakeholders during the consultation period, 9 of which were with organisations that did provide a formal consultation response. Annex B contains a list of those who responded.

2. The following is a summary of the consultation responses received. It does not capture every point made.

Question 1. Do you agree with the proposal to set the level of RO support for new solar PV broadly in line with the FIT for solar PV (>250kW-5MW) (i.e. 1.5 ROCs for new accreditations and additional capacity added in 2013/14, 1.3 ROCs for new accreditations and additional capacity added in 2014/15, 1.1 ROCs for those in 2015/16 and 0.9 ROCs for those in 2016/17)?

3. Of the 45 responses received, 5 (11%) agreed or agreed with qualifications; 37 (82%) disagreed; and 3 (7%) neither agreed nor disagreed or did not comment.

4. Of those who agreed or agreed with qualifications some thought it was important that RO and FITs incentive schemes should be aligned so that the developer is not incentivised to favour one tariff over another regardless of the project characteristics. While many accepted that degression was justified many pointed out that a degression of 0.2 ROCs did not align well with the future path of costs in the sector.

5. Respondents provided a range of views about the most appropriate ROC rates. Many expressed a preference for support at 1.8 ROCs but a range of views were offered from 1.5 ROCs to 2.0 ROCs in 2013/14. A number felt that the proposed support levels would not bring forward much deployment noting that only one station had deployed at the ‘equivalent’ FIT rate between 250 kW and 5 MW since April 2012. There were a wide range of comments on the modelling assumptions used.

6. Many of those who disagreed with the proposed support rates also disagreed with the FITs equivalence policy. Some were of the view that the FITs equivalence policy ignored the fact that the two incentive schemes had very different risk profiles. Others pointed out that the RO is more complex than the FITs scheme, that cash flows are harder to forecast and there are a number of additional charges which generators have to pay.

7. It was also noted by some that the FIT is structurally more attractive to investors, providing fully RPI linked electricity and subsidy income which can be securitised into lower cost financial vehicles that are RPI linked. It was also pointed out that the generator receives 100% of FIT income. In comparison, RO electricity and recycle prices are subject to full market risk and uncertainty over the life of the asset. It was suggested that the ROC bands

should be set at levels that provide investors with an equivalent 'risk adjusted' return to the return obtainable under FITs.

8. In addition to comments on the level of support, one respondent felt that there was insufficient knowledge of the actual cost reductions and future deployment to justify setting the RO level of support for any point from 2014/15 onwards. Several respondents believed that because of the length of large-scale projects (6-18 months) there was a need to grandfather support at the preliminary accreditation stage.

Question 2. Do you agree with our proposals to control costs of solar PV support within the RO by making use of the existing provisions for early review?

9. Of the 45 responses received, 18 (40%) agreed or agreed with qualifications; 20 (44%) disagreed; and 7 (16%) neither agreed nor disagreed or did not comment.

10. Of those who agreed or agreed with qualifications many indicated that the cost control mechanism provided a reasonable balance between providing sufficient certainty to the industry and the flexibility needed to control costs under the RO, given the deployment rates for large-scale solar PV are very difficult to predict. One respondent stressed the need to have a flexible yet stable structure to support the emerging solar PV market. Another respondent noted the need to ensure value for money for consumers in the RO mechanism and pointed out that reviews could also result in band increases. A few of those that responded indicated a preference for rolling or annual cost assessments.

11. It was also suggested that annual reviews would provide some uncertainty but they would not be a 'bolt out of the blue'. A further respondent indicated that it was vital that industry should be fully engaged in the evaluation process and suggested that a working group with industry representation should be established. A further respondent was in agreement with the mechanism so long as the changes were consulted on at least 18 months prior to implementation.

12. Some pointed out that the threat of early reviews actually increased the risk profile of projects and this extra risk would need to be factored into the overall cost. It was suggested that some protection needs to be in place to ensure that projects that had made a final investment decision with the expectation of a certain RO banding level should not suffer the impact of an early review. A few wanted an enhanced preliminary accreditation process to provide such protection while some requested a cost control mechanism with a deployment trigger.

13. Of those who disagreed with the proposals to control cost many were of the view that the existing mechanism threatened confidence and built uncertainty into the system. Several respondents indicated that frequent reviews increase the cost of capital as the investment becomes riskier. One respondent indicated that they would prefer to have aggressive annual reductions as it improves certainty and reduces the likelihood of a review.

14. Some respondents noted that the structure of the RO was such that DECC had more time than with the FITs scheme to deal with higher than expected deployment; and suggested that the Obligation, which is set annually by the Government, would in effect prevent excessive deployment as the value of a ROC would decrease if deployment exceeded the amount set out in the Obligation.

15. Several respondents suggested that to mitigate the effect of these reviews, preliminary accreditation with a guaranteed ROC level should be considered for projects planned and costed with finance secured. They also suggested that there should be a review of grace periods.

Question 3. Do the capital costs of solar PV projects >5MW benefit from economies of scale? If so, which cost elements benefit?

16. Of the 45 responses received,17 (38%) agreed or agreed with qualifications; 8 (18%) disagreed; and 20 (44%) neither agreed nor disagreed or did not comment.

17. Of those who agreed or agreed with qualifications, the majority of respondents suggested that economies of scale existed in relation to component purchasing and project setup costs. This tended however, to be qualified on the basis that costs vary significantly according to the size, type, location and the availability of grid access for a particular project.

18. Many of those who agreed or agreed with qualifications pointed out that economies of scale were available in equipment procurement costs. One respondent suggested that whilst economies of scale do exist, project aggregation can bring efficiencies for management and construction. Several different views were expressed on when economies of scale were achievable.

19. Of those who disagreed, very few challenged the notion that economies of scales existed in component purchasing and project set up costs. Several indicated that there are a number of components where the price is dependent on the price of raw materials and labour and that supply chain constraints created an upward pressure on particular costs. A few indicated that bigger projects have higher failure rates which also has an impact on cost.

20. Many respondents suggested that large-scale solar PV projects are often more complex and sometimes incur additional planning/legal costs. Another respondent suggested that bigger projects sometimes need to have road access and/or be connected to the water mains. Another respondent indicated that bigger projects often need enhanced security measures (required by insurance) and enhanced environmental screening measures. It was also pointed out that larger sites tend to require more site levelling and remediation work. One respondent felt that marginal economies of scale would only relate to improved process efficiencies rather than price reductions for materials and components.

21. Several expressed a view that larger solar PV projects incur disproportionally higher grid connection costs. They noted that larger systems tend to need to connect straight to the grid at higher voltages with new connecting infrastructure and that there tended to be a greater cost associated with an 11kV grid connection than a 33kV connection. Again, many qualified this by indicating that costs varied significantly according to the size, location and grid characteristics of the site. Some pointed out that a larger project is more likely to require bespoke transmission design and specialist high voltage equipment, while others highlighted a more complex and lengthy grid approval process.

22. A significant number of those that responded made reference to economies of scale in relation to operation and maintenance and finance costs.

23. Respondents who neither agreed nor disagreed cited lack of hard evidence as the main reason but one such respondent did observe that units used in large-scale solar PV were just multiples of smaller-scale projects.

Question 4. Are there additional costs or hurdles associated with large solar PV that are not present in sub 5MW solar PV, for example supply chain constraints? Do you expect these costs to change as the UK's large scale solar PV sector matures?

24. Of the 45 responses received, 28 (62%) agreed or agreed with qualifications; 4 (9%) disagreed; and 13 (29%) neither agreed nor disagreed or did not comment. In addition, 6 (13%) respondents agreed that costs would change as the sector matures and 4 (9%) disagreed. The rest did not comment.

25. A significant number of those that responded to this question highlighted the grid as an area where additional costs or hurdles were present. A number specifically pointed out issues relating to capacity limitations, the need for more complex infrastructure and longer lead times for connection. Some reported supply chain constraints, including long lead times and large deposits for switch gear and other high voltage components as an important factor.

26. A number of those that responded highlighted finance as an issue. Some stated that obtaining finance for larger more complex projects was more difficult and more expensive and the risk profile was significantly enhanced by the longer development cycle. It was also indicated that investors were less confident with ROCs as a traded commodity with more variable and complex pricing than the FITs scheme; and pointed out that risk is often being priced into projects due to limited market knowledge/experience.

27. There was a widely held view that the planning process was more complex and involved for large-scale projects. A number of issues such as extensive community consultation and a more detailed Environmental Impact Assessment process were emphasised. A few also highlighted additional legal costs associated with resolving wayleaves and easements.

28. Of those respondents who disagreed no further comments were provided.

29. Of those who agreed or agreed with qualifications that costs would change as the sector matures, the majority expected some components to become cheaper in the future, although others thought that development, planning and grid connection costs would rise. A few highlighted the uncertainty of future costs and the dependency on future pricing in the global PV market as key factors.

30. Of those respondents who did not expect costs to change as the sector matures, no further comments were provided.

Question 5. Do the performance characteristics of >5MW projects differ from sub 5MW?

31. Of the 45 responses received, 4 (9%) agreed or agreed with qualifications; 21 (47%) disagreed; and 20 (44%) did not answer or the answers were unclear.

32. Of those who agreed or agreed with qualifications respondents felt that larger sites had slightly higher efficiency. Several respondents, however, made the point that the key differentiator between projects was not size but type. A number of those that responded indicated that ground-mounted projects tend to have different performance characteristics to

roof-mounted projects. It was pointed out that that ground-mounted projects can be orientated for maximum output whereas roof-mounted projects were often deployed in a sub-optimal manner due to architectural constraints. One respondent did, however, point out that correct design could optimise performance at any size.

33. Of those who disagreed, most respondents felt that solar PV was a truly scalable technology and performance characteristics such as yield and performance ratio (%) are nearly identical, with the most significant variable impacting on performance being the level of irradiation. Several respondents made the point again that the key differentiator in performance was between ground and roof based installations.

Question 6. Do you agree with this assessment of the deployment potential of large scale solar PV out to 31 March 2017?

34. Of the 45 responses received, 1 (2%) agreed or agreed with qualifications; 27 (60%) disagreed; and 17 (38%) did not answer or the answers were unclear.

35. The one respondent who agreed with qualification suggested that deployment was dependent on there being a supportive ROC regime. Of those who disagreed, the majority of respondents felt that the assessment was too low and was inconsistent with previous projections for solar PV. It was suggested that the existing figures underestimated both the unconstrained potential and the amount of capacity that could be deployed in the short and medium term. Another stated that the deployment potential forecasts were not based on any meaningful data and were considerably below the ability of the market.

36. A number of respondents offered a view on the deployment potential but these varied considerably from 1.2 GW to 50 GW. Some pointed to a large potential in both low grade agricultural land and large commercial roofs, others highlighted possible limitations including grid capacity and capacity at electricity substations. Some suggested that accurate predictions were not possible while a few indicated a preference for volume targets rather than an assessment of deployment potential.

Annex B:Summary of biomass responses

1. In total 49 responses were received to the biomass affordability consultation. These included responses from electricity suppliers, independent generators & investors, feedstock suppliers, other wood-using industries, NGOs and private individuals. In addition, there were a series of stakeholder workshops and meetings. The following is a summary of the consultation responses received:

Q15. Do you agree that the proportion of their renewables obligation that suppliers can meet using new dedicated biomass generation should be capped at 19% in 2013/14, 17% in 2014/15, 14% in 2015/16 and 12% in 2016/17 (equivalent to approximately 1GW of new dedicated biomass generating capacity). Please provide evidence to support your arguments.

2. Of the 31 responses that addressed this question, 5 agreed with the supplier cap proposal and 26 disagreed.

3. Non-energy wood-using sectors and some NGOs agreed to the principle of a cap but preferred a lower cap, ideally zero. Several responses highlighted that biomass should be used in manufacturing or in other energy sectors such as heat and CHP.

4. Conversely, the bioenergy industry – developers and investors – strongly opposed the introduction of a supplier cap. Industry concerns included that under a supplier cap, new dedicated biomass power ROCs would trade at a significant discount to conventional ROCs. Moreover, this would make it more difficult for independent generators to access a Power Purchase Agreement (PPA) and financing. Some industry respondents highlighted that a cap was unnecessary as other issues such as feedstock availability and the typical build times for large plants would limit the amount of new biomass plant coming forward under the RO.

5. However, there was widespread industry agreement that if a cap were to be introduced it should be applied at the generating capacity (power producer) level rather than at the supplier (wholesale energy buyer) level. This would avoid the creation of a separate market for the new dedicated biomass ROCs, and hence avoid many of the associated issues with PPAs and financing that can particularly impact the independent generator. One respondent supplied their own legal advice that Government may have sufficient 'general' powers under the Electricity Act 1989 to bring in a generation-based cap.

Q16. Do you agree that new dedicated biomass with good quality combined heat and power (CHP) should be outside the cap?

6. Of the 35 responses received that addressed this question, 28 agreed and 7 disagreed.

7. Combined heat and power was seen by a broad cross-section of stakeholders as offering significant benefits which justified it being excluded from the cap. However, concerns were

raised that the possible loss of heat customers could result in a bona fide CHP project falling within the scope of the cap due to the resulting changes in the plant's performance as assessed under the CHPQA programme. This would generate additional uncertainty not only for CHP projects, but also for new dedicated biomass power plants. Several CHP developers recommended that the exemption should apply permanently from the first CHPQA assessment, or that CHPQA requirements should be grandfathered to help investors and generators better manage this risk to ROC income.

Q17. What are your views on the notification process set out at paragraphs 12.25-12.28? Are there other notification or pre-accreditation options you think would work? Please set these out as fully as possible in your reply.

8. Of the 13 responses that addressed this question, 6 agreed with the broad approach outlined, 7 disagreed. The basic principle of a notification process to provide market clarity, and help manage investment risk was welcomed. Many considered it essential to have complete clarity on pipeline in order to secure investment. There was some consensus that 'financial close' or 'final investment decision' should be the point at which space is reserved in the cap (if a capacity-based cap were possible).

9. There was broad agreement that requirements would need to be robust enough to ensure projects were shovel-ready, but not as complex as to add significant costs for the developer or managing the register. But views diverged widely on the specifics of the evidence that should be used to enable notification, and whether supplying data should be mandatory or voluntary.

Q18. Do you agree that support levels for standard co-firing and co-firing of regular bioliquids should be reduced to 0.3 ROCs/MWh in 2013/14 and 2014/15, and that support levels for standard co-firing with CHP should be reduced to 0.8 ROCs in 2013/14 and 2014/15? If not what levels would you recommend and why? Please provide evidence of the impacts of your proposal.

10. Of the 19 responses to this question, 7 agreed, 12 disagreed. Reasons for supporting this approach included that this would help control possible price rises for UK-sourced biomass, and help other wood-using industries. However, some sellers of UK-sourced biomass opposed the proposal for the exact same reason, citing that it was a difficult economic climate and better prices for UK wood residues needed to be maintained.

11. Generators also typically disagreed with the proposal, highlighting that our proposal to reduce support was not driven by falling costs for standard co-firing, but instead based on an aim to remain within budget and encourage the more rapid move to enhanced co-firing and full conversions. Other concerns raised by the power industry included that some power plants may not resume co-firing in 2015, due to the 2-year break in supply contracts or loss of transport/storage infrastructure, which could then impact the UK's ability to meet its renewables target in 2020.

Q19. Do you agree with our preferred option for the removal of the energy crop uplift for standard co-firing?

12. Of the 18 responses to this question, 10 agreed, 8 disagreed. Reasons for supporting its removal included that this would provide consistency of treatment across different levels of co-firing, or that the lower costs of energy crops – particularly from countries outside of the

EU and North America - made the uplift unnecessary. Some strongly opposed the removal of the additional support, concerned that in future, only imported energy crops would be used, and the UK's embryonic energy crop supply-chain would be lost. One respondent highlighted that the UK changing its approach would undermine confidence in any similar schemes to promote energy crops in the future.

13. One alternative approach put forward was to introduce a cap on the maximum percentage of energy crops used by a generator with respect to total biomass feedstocks – e.g. 5% of all biomass annually consumed by a particular power plant - would be a better way forward.

Q20. Do you agree that where stations are able to benefit from the transitional arrangements, the energy crop uplift for standard co-firing should be 0.5 ROCs?

14. Of the 12 responses to this question, 8 agreed, 4 disagreed. Most agreed that 0.5 ROCs was the appropriate level for the transition process. Those opposed were concerned about retaining a level playing field. One response highlighted that the extra 0.5 ROCs for energy crops would be more than generators would receive for standard co-firing itself under the consultation proposals – at 0.3 ROCs/MWh in 2013/14 and 2014/15.

Annex C: List of solar PV respondents

AEE Renewables plc
Ardenham Energy
Belectric Solar Ltd
Bluefield
BNRG Renewables Ltd
British Gas
Carrillion Plc
Dulas MHH Ltd
Eco Energy World
Ecotricity
EDF Energy Ltd
Electric Corby CIC Ltd
Ennoviga Solar Ltd
Good Energy
Green Nation
Green Power Ventures Ltd
Hazel Capital LLP
Ib vogt GmbH/Vogt Solar Ltd
Inazin Power Ltd
Juwi Renewable Energies Ltd
Kingspan Ltd
Lark Energy
Low Carbon
Myriad CEG Ltd
National Farmers' Union
Ofgem
Orta Solar
OST Energy Ltd
REC Solar
Renewable Energy Association (REA)
Renewable Energy Systems Ltd
Renewable Power Ltd
Riomay Ltd
Scottish Power
Shire Oak Energy Ltd
SmartestEnergy
The Solar Building Company
Solar Trade Association (STA)
Solarcentury Holdings Ltd
Southern Solar Ltd
Solar Power Generation Ltd
Stockport Metropolitan Borough Council
TGC Renewables Ltd
1 private individual and 1 independent consultant

Annex D: List of biomass respondents

AB Sugar
Arkady Feed UK
Biofuelwatch
Biomass UK
BNP Paribas
BSW Timber
Centrica Energy
Combined Heat and Power Association
Confederation of Paper Industries (CPI)
DALKIA PLC
Drax Power Ltd
E.On
Eco2
Eco-Frontier
EDF Energy
EDF Trading Limited
Energy Power Resources Limited
Energy UK
Ernst and Young
Estover Energy Limited
Fichtner Consulting Engineers
Forth Energy
Friends of the Earth
Gaia Power Tees Valley Limited
GB Renewables Investments Ltd
GDF SUEZ Energy International
GTP Border Forest/Border Forest Products
Helius Energy plc
Iceni Energy Limited
MGT Power
No Southampton Biomass
Peel Energy Ltd
Renewable Energy Association (REA)
RES
Royal Society for the Protection of Birds (RSPB)
RWE
Scottish Power
SmartestEnergy
SSE plc
Standardkessel Baumgarte UK Ltd
Wykeham Consulting – NSB
Stockport Metropolitan Borough Council
Tees Valley Unlimited – The Local Enterprise Partnership
UPM Tilhill Forestry
Welsh Government Energy and Environment Panel
Wood Panel Industry Federation
2 private individuals and 1 independent consultant

Annex E: List of advanced fuel respondents

2GB Consulting
Advanced Plasma Power Ltd
Biomass Power Projects Ltd
Biossence Ltd
Chartered Institution of Wastes Management
EDF Energy
ENERGOS Ltd
Environmental Services Association
Enviropower Ltd
HES Biopower Ltd
Keld Energy Ltd
KIV UK
KTI Energy Ltd
LowC Communities
Metso Power Oy
MITIE Asset Investment
MWH
New Earth Group
Nexterra Systems Corp
Ofgem
O-Gen UK
Plasco Energy Group Inc
Renewable Energy Association (REA)
Verus Energy Ltd

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