Summary: Intervention & Options

Department /Agency: DECC	Title: Impact Assessment of Feed-in Tariffs for Small-Scale, Low Carbon, Electricity Generation (URN10D/536)	
Stage: Final	**Version:** Final	**Date:** 01 February 2010

Related Publications: Consultation on Renewable Financial Incentives; Renewable Energy Strategy.

Available to view or download at: http://www.decc.gov.uk/en/content/cms/consultations/elec_financial/elec_financial.aspx

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

Our 2020 renewables target requires all parts of society to make a contribution. Experience with existing policy measures (in particular the Renewables Obligation) suggests that businesses, organisations and individuals outside the energy sector require a simple, accessible policy framework to encourage them to take up renewable electricity generation.

What are the policy objectives and the intended effects?

The scheme will drive uptake of a range of small-scale low carbon electricity technologies by a range of target groups in order to deliver a higher rate of deployment. The scheme will also pursue broader aims of engaging the general public in low carbon electricity generation. The introduction of Feed-in Tariffs (FITs) will create a subsidy framework which is easily understood, offers more certain returns and covers a wide range of sub-5MW technologies. This will enable broad participation of individuals and communities, as well as energy professionals, in the "big energy shift" to a low carbon economy. As well as providing a direct contribution to the 2020 Renewable Energy Target, the policy is in line with longer-term energy and climate change goals.

What policy options have been considered? Please justify any preferred option.

A number of options were considered for the FITs consultation published on 15 July 2009. A 'rate of return' approach was considered to deliver the best overall balance of cost-effectiveness, contribution to the 2020 renewable energy target, engagement at the household level, and compatibility with broader energy policy. The consultation lead scenario was chosen to strike a balance between the objectives outlined above and the relative expense/ease of deployment of the various technologies.

Following the FITs consultation and further analysis, we have worked to refine the consultation lead scenario in order to further improve the effectivness of the scheme for sub-5MW renewable technologies and have developed a generation tariff for non-renewable domestic scale microCHP.

When will the policy be reviewed to establish the actual costs and benefits and the achievement of the desired effects?

There is flexibility in the policy design to allow for adjustments to be made as evidence on actual deployment, costs and performance emerges to ensure that the scheme is operating effectively. This IA considers the impacts (costs and benefits) of the proposed FITs. Caveats, risks and uncertainty are also set out. Once the scheme has been implemented, it will be regularly reviewed with the first review due to take place in 2013.

Ministerial Sign-off For SELECT STAGE Impact Assessments:

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

Signed by the responsible Minister:

....Date: 01 February 2010

Summary: Analysis & Evidence

Policy Option: Chosen	Description: Feed-in tariffs to support sub-5MW low carbon electricity generation

COSTS

ANNUAL COSTS		Description and scale of **key monetised costs** by 'main affected groups'	
One-off (Transition)	**Yrs**	The estimated resource cost is £570m in 2020, **£8.6bn** cumulative to 2030. The estimated cost to consumers, cumulative to 2030, is £6.7bn. This leads to an average increase in annual household electricity bills of approximately £8.50 over the period 2011-2030.	
£			
Average Annual Cost (excluding one-off)			
£ 610m		**Total Cost** (PV)	£8.6bn

Other **key non-monetised costs** by 'main affected groups' Costs not included:- costs of grid connection; indirect costs to the economy of increased energy prices.

BENEFITS

ANNUAL BENEFITS		Description and scale of **key monetised benefits** by 'main affected groups'	
One-off	**Yrs**	Benefits are monetised carbon savings from the displacement of fossil fuels in electricity generation. Carbon savings are made in the EU ETS sector, hence the traded price of carbon is used to value these savings. The value of carbon saved, cumulative to 2030 is **£420m**.	
£			
Average Annual Benefit (excluding one-off)			
£ 30m		**Total Benefit** (PV)	£ 420m

Other **key non-monetised benefits** by 'main affected groups' Additional benefits include:- contributing to the UK's renewable energy target; greater consumer engagement; diversifying the energy mix; reducing dependence on (imported) fossil fuels; greater energy security at the small scale; business and employment opportunities in developing and deploying renewable technologies; reductions in losses through transmission/distribution networks; innovation benefits and potential reductions in technology costs as a result of roll-out.

Key Assumptions/Sensitivities/Risks Fossil fuel price and discount rate sensitivities have been carried out. Costs will also be highly dependent on outturn uptake rates.

Price Base Year 2008	Time Period Years 20	**Net Benefit Range** (NPV) £	**NET BENEFIT** (NPV Best estimate) £ -8.2bn

What is the geographic coverage of the policy/option?			GB	
On what date will the policy be implemented?			April 2010	
Which organisation(s) will enforce the policy?			DECC/Ofgem	
What is the total annual cost of enforcement for these organisations?			Ofgem to publish cost	
Does enforcement comply with Hampton principles?			Yes	
Will implementation go beyond minimum EU requirements?			N/A	
What is the value of the proposed offsetting measure per year?			£ N/A	
What is the value of changes in greenhouse gas emissions?			£ 420m (carbon)	
Will the proposal have a significant impact on competition?			No	
Annual cost (£-£) per organisation (excluding one-off)	Micro	Small	Medium	Large
Are any of these organisations exempt?	Yes	Yes	N/A	N/A

Impact on Admin Burdens Baseline (2005 Prices) (Increase - Decrease)

Increase of	£ 18m	Decrease of	£	**Net Impact**	£ 18m

Key: Annual costs and benefits: Constant Prices | (Net) Present Value

Evidence Base (for summary sheets)

A. Strategic overview

1. The Energy Act 2008 introduced powers for the Secretary of State to implement Feed-in Tariffs (FITs) for small-scale low carbon electricity generation. FITs have the potential to be a more appropriate mechanism for incentivising small-scale generation than the RO with its intentional focus on large scale deployment.

2. Renewable generation at the small scale can make a contribution to the electricity component of the UK's 2020 renewable energy target. It also brings potential wider benefits of behavioural change and reduced distribution and transmission losses.

3. Feed-in tariffs are a per unit subsidy payment (p/kWh) for sub-5MW low carbon electricity generation. The design for FITs is intended to provide the right level of simplicity and certainty to encourage non-energy professionals, including householders, to invest in small-scale generation. The FITs will be funded by a levy paid by electricity suppliers which is expected to be passed through to final electricity consumers.

4. Bringing electricity generation closer to the public and involving individuals, communities and businesses as producers of energy (in addition to their usual role as consumers) means that people can make an active contribution to our energy and climate change goals. Government and Parliament has shown a desire to involve individuals and communities in small-scale electricity generation by making it cost-effective for them to do so.

5. This Final Impact Assessment (IA) presents analysis on the possible costs and benefits of implementing FITs. It builds on the FITs Consultation IA published alongside the Renewable Electricity Financial Incentives Consultation[1].

B. Objectives

6. The objective of FITs is to contribute to the UK's 2020 renewable energy target and carbon saving targets through greater take-up of low carbon electricity generation at the small scale and to achieve a level of public engagement that will engender widespread behavioural change. This is intended to result in a better understanding of energy use and acceptance of renewable energy technologies.

7. In addition to encouraging greater awareness and local action by individual consumers, communities and non-energy businesses, the scheme will yield a number of other important benefits including: diversifying the energy mix, reducing dependence on (imported) fossil fuels, greater energy security at the small scale, business and employment opportunities in developing and deploying renewable energy technologies, and avoidance of losses through transmission/distribution networks.

8. Government intervention to encourage uptake of low carbon energy sources aims to correct market failures that result from use of fossil fuels. Fossil fuel use is the primary contributor of greenhouse gases associated with climate change. This results in negative externalities whereby the costs of climate change are borne by those not directly involved in the use of fossil fuels.

[1] http://www.decc.gov.uk/en/content/cms/consultations/elec_financial/elec_financial.aspx

9. The Feed-in Tariff support mechanism will also help to address innovation market failures by driving higher uptake of small-scale low carbon electricity generation whose potential is not being fully realised due to the current high costs of generating at this scale. FITs will enable greater deployment levels to be achieved, thus allowing supply chains and economies of scale to develop. It is expected that this would allow the costs of installing these technologies to fall in the future thereby increasing competitiveness. This in turn will enable the innovation and other benefits of these low carbon technologies to be realised.

10. Under a business-as-usual scenario (i.e. Renewables Obligation (RO), no FITs), generation from sub-5MW renewable installations is expected to account for approximately 3TWh (or 0.8%) of total electricity demand in 2020. This generation is projected to occur via approximately 5,000 installations, primarily at the non-domestic scale. TWh of generation are concentrated amongst a few technologies, particularly large wind, closer to the 5MW capacity limit of FITs. FITs are expected to increase this level of renewable uptake through addressing the main barrier currently preventing investment at the sub-5MW level i.e. high installed technology costs. FITs will also provide households with increased certainty, thereby encouraging them to invest, where currently the RO does not provide sufficient support for significant uptake to occur.

11. Our analysis considers three Feed-in Tariff scenarios, with our chosen scenario projected to deliver approximately 6TWh (or 1.6%) of final UK electricity consumption in 2020. This generation is undertaken by approximately 750,000 renewable installations (approx 725,000 of which are at the domestic scale), a significant increase over the business-as-usual (BAU). TWh of generation occurs via a more diverse mix of technologies and technology scales (including domestic scale wind and solar PV) compared to the BAU.

12. This IA provides a recap on how we arrived at a 'rate of return' approach to tariff-setting as per the consultation lead scenario and then analyses the costs and benefits of various refinements to the consultation lead scenario, leading to our chosen scenario.

C. Costs and benefits of implementing FITs

(i) Business-as-usual

13. Under business-as-usual, the current Renewables Obligation (RO) subsidy framework is projected to incentivise approx 3TWh of sub-5MW renewable electricity generation[2] per annum by 2020. This will be mainly concentrated in the large wind sector with little uptake taking place at the household level. Current uptake is driven by grant support and the RO.

(ii) Feed-in tariff

Introduction

14. Since the Government put in place powers in 2008 to enable the introduction of FITs for installations up to 5MW electricity generation capacity, DECC has undertaken significant analysis in order to better understand the barriers to uptake of small-scale low carbon

[2] Not including landfill or sewage gas.

electricity generation (e.g. financial barriers and supply and demand side barriers). We are proposing a tariff structure and set of tariff levels that we believe will foster behavioural change and encourage greater engagement by individuals and communities in the renewable energy and climate change agenda, whilst also having consideration for the costs of the scheme that will ultimately be borne by electricity consumers.

Eligibility

15. At the start of the scheme in April 2010, the following technologies will be supported: new anaerobic digestion, hydro, solar photovoltaic (PV) and wind projects up to the 5MW FITs capacity limit. FITs support will also be provided to the first 30,000 micro combined heat and power (microCHP) installations with an electrical capacity of 2 kilowatts (kW) or less, as a pilot programme. The scheme will not initially support solid and liquid biomass technologies, though these will continue to be supported under the Renewables Obligation at all scales.[3]

Tariff structure

16. We propose the following basic structure for FITs:
    - A fixed payment from the electricity supplier for every kilowatt hour (kWh) generated (the "generation tariff").
    - Another payment additional to the generation tariff for every kWh exported to the wider energy market (the "export tariff"). Generators will be guaranteed a market for their exports at a long-term guaranteed price. The generator may opt out of this guarantee and negotiate a price for exported electricity in the open market.
    - In addition, generators will benefit because they can use the electricity they generate on-site to offset some or all of the electricity they would otherwise have had to buy.
17. This tariff structure reflects a 'premium' FIT structure[4], which essentially means that the generator owns the electricity that they generate. This allows for the tariff structure as set out above and this proposed structure is intended to encourage generators to consume the electricity they generate on site (as they will benefit from bill savings) and become more energy efficient while they do so (in order to maximise their gains from the export tariff).
18. The split of tariff revenue stream between generation tariff and export tariff has been chosen in such a way that the export tariff reflects the value of small-scale exported electricity to the supplier and the generation tariff (together with bill savings) makes up the remaining required support to deliver an approximate 5-8% return on investment. The generation tariff is cost-reflective and is therefore banded (i.e. varies) according to technology type and technology scale. In the FITs consultation, an export tariff of 5p/kWh was proposed. However, following feedback from the consultation this value has been revised down to 3p/kWh (further explanation is given in para 42). The guaranteed tariff for exports does not preclude generators from negotiating with their supplier to try to secure a higher payment for their exports.
19. The combination of a fixed generation tariff and fixed export tariff effectively provides a fixed revenue stream per kWh of electricity generated under FITs. This is regarded as a

[3] For information about eligibility and registration requirements for biomass installations under the Renewables Obligation see http://www.ofgem.gov.uk/Sustainability/Environment/RenewablObl/Pages/RenewablObl.aspx
[4] For further information on premium tariff structure, please see p59 of Element Energy/Poyry quantitative report: http://www.decc.gov.uk/en/content/cms/consultations/elec_financial/elec_financial.aspx

particularly efficient system for generation at the small scale[5], providing a level of certainty that should encourage greater levels of investment in small-scale low carbon electricity than is currently seen.

20. Both the generation tariff and export tariff will be index-linked in order to maintain the real value of the tariff revenue streams over time. The tariffs will be index-linked to RPI which means that the approximate 5-8% return on investment will be maintained in real terms.

21. It should be noted that tariffs have been set to provide an approximate 5-8% return on investment (ROI) for well-sited installations, taking into account all three potential benefit streams (generation tariff, export tariff and bill savings). For each tariff band, a tariff is set to yield a 5-8% ROI for a 'reference' installation. For example, for domestic PV, the reference installation assumed is a 2kWp installation producing 850kWh/kWp/year at a capital cost of approx £11,000[6]. In reality no two installations (of the same type and scale) are likely to produce the exact same level of generation per year for the exact same cost. Hence in reality, outturn rates of return will vary slightly from installation to installation.

Scheme benefits

22. As well as contributing to the UK's challenging renewable and carbon reduction targets, the FITs scheme will deliver some of the more intangible benefits outlined below. Though some of these may be difficult to quantify, we believe these benefits to be real and significant and therefore must not be overlooked when considering the scheme's overall cost-effectiveness. Benefits of the scheme include the following:-

- Providing an export tariff encourages the generator to increase energy efficiency since the less energy that they use, the more they can export and hence gain from the export tariff. Providing this incentive to be energy efficient helps to drive changes in behaviour through FITs.
- Small-scale distributed generation realises the benefits of using electricity at the point it is generated. A proportion of electricity generated in large power stations (such as coal, gas or nuclear) is lost when it is transmitted from the power stations to the centres of demand where it is used; around 2% of electricity is lost in transmission and around 5% in distribution. Onsite generation that is incentivised by FITs will reduce such transmission and distribution losses (approx 0.4TWh transmission/distribution loss would be avoided in 2020 under the chosen scenario).
- Prospective small-scale generators with onsite usage, especially householders and small businesses, will see a major benefit in becoming more energy independent. Generating onsite means that they will be able to reduce their electricity imports which will reduce the impacts of rising electricity costs. For businesses with high electricity costs, this is likely to be a particular attraction of installing small-scale low carbon generation. They are able to remove or reduce the risk and volatility of a significant cost to their business as well as, through FITs, having an additional income stream from that generation.
- A key aspiration of FITs is to foster behavioural change. There is some evidence that people who install small-scale generation may develop a greater understanding of energy and become more efficient energy consumers[7].

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[5] See report on Qualitative Issues in the Design of the GB Feed-in Tariffs http://www.decc.gov.uk/en/content/cms/consultations/elec_financial/elec_financial.aspx

[6] For further information on technology costs please see Quantitative Analysis of the Design of Feed-in Tariffs http://www.decc.gov.uk/en/content/cms/consultations/elec_financial/elec_financial.aspx

[7] Sustainable Consumption Roundtable (2005), Seeing the Light: the impact of micro-generation on how we use energy. www.sd-commission.org.uk/publications/downloads/Micro-generationreport.pdf

- Feed-in Tariffs will deliver business and employment benefits through supporting the small-scale low carbon technology industry.
- The scheme will drive greater uptake of technologies at the small scale and hence drive down costs into the future, helping to address current innovation market failure.
- Quantifiable benefits of FITs (via TWh of low carbon electricity generated and via carbon savings) are set out in the results section below.

The model

23. The results presented in this IA are based on analysis using a model built by independent consultants, Element Energy/Poyry Consulting[8]. Their initial study looked into the costs and potential uptake for a range of technologies including wind and solar PV. The model has since been updated to allow for testing additional policy options put forward as a result of the consultation process.

24. The FITs model works by comparing the generosity of a given FIT against return on investment (ROI) thresholds at which investors are assumed to become active. The threshold at which a particular investor will invest is determined by their "hurdle rate"[9], which in turn is determined by a range of factors including cost of capital, preferences on payback periods, and alternative investment opportunities. To invest, an investor with a high hurdle rate will require a higher rate of return (and hence FIT level) than an investor with a low hurdle rate. On the supply side, assumptions about maximum market growth rates and public acceptance of increasing levels of deployment for the various technologies act to constrain uptake if FITs are very generous. In general, a higher subsidy level will see faster and higher levels of uptake.

25. The model covers a range of technologies which will be included in the Feed-in Tariffs system for Great Britain. These technologies vary in scale, ranging from household-level microgeneration up to industrial scale technologies with a capacity ceiling of 5MW. These technologies vary widely in generation costs (£/MWh), which tend to be inversely correlated with scale, ranging from relatively low-cost of generation large-scale projects such wind turbines, to relatively expensive cost of generation domestic-scale technologies. The technical potential for deployment also varies widely amongst the technologies. Solar PV, which can be placed on any roof with a southerly-east to west aspect and also on the ground has a larger technical potential than hydro which is constrained by the availability of suitable water flow. Further information on technical potentials can be found in the Element Energy/Poyry report that accompanied the consultation document[10].

26. Within the model, investors are divided into four broad categories: householder, commercial (including public sector), developer and utility. The model gives these investors different options of technology and scale to invest in (e.g. householders cannot invest in large wind turbine projects) and also the rate of return that they require before making an investment. Generally speaking, professional investors such as utilities and developers operate at the larger scale and have relatively high hurdle rates distributed across a narrow range. In contrast, commercial and householder investors operate at a smaller scale and have a wide range of hurdle rates, meaning that some are willing to invest at a low rate of return whereas others require very high rates of return before investing. Further information on hurdle rate assumptions is provided in the Element Energy/Poyry report.

[8] For additional information and explanation see Quantitative Analysis of the Design of Feed-in Tariffs http://www.decc.gov.uk/en/content/cms/consultations/elec_financial/elec_financial.aspx

[9] A hurdle rate reflects the minimum rate of return that a party will consider before taking up an investment opportunity.

[10] Quantitative Analysis of the Design of Feed-in Tariffs http://www.decc.gov.uk/en/content/cms/consultations/elec_financial/elec_financial.aspx

27. The model allows for the analysis of a number of policy design features which are present in FITs regimes in other countries or have been considered potentially relevant to a FITs scheme for Great Britain. These include: *banding by technology and scale* which allows targeting of tariff levels to reflect installation-specific costs in order to avoid excess profit (rents); *degression rates* which reduce tariff levels by a fixed percentage each year for new installations to reflect falls in technology costs[11] over time and to drive innovation and cost reduction[12]; and the option of setting a *fixed financial rate of return* across all technologies and scales.

28. This impact assessment considers the impacts of FITs policy only and does not attempt to quantify the effects of other policies (such as Zero Carbon Homes) that may also influence uptake of renewable and low carbon generation at small scales. Results are presented (unless stated otherwise) as additional to the baseline (business-as-usual). The baseline is the state of the world in absence of FITs, in other words projected uptake under current support mechanisms (i.e. the banded RO). Under the DECC central fossil fuel price scenario and baseline assumptions, around 3TWh of sub-5MW renewable electricity is anticipated per year by 2020. This capacity will mainly be concentrated in the large wind sector and relatively few installations will be incentivised compared to the FITs scheme.

29. As with any model, the Element Energy/Poyry model is based on a number of assumptions around which there will be a degree of uncertainty. Therefore the model outputs should be regarded as illustrative best estimates and treated with an appropriate degree of caution, especially given that this is a new scheme where uptake will be dependent on how the market responds to the tariffs set. However, the policy will be designed to be flexible (e.g. with regular tariff reviews, corresponding with the RO reviews) so that it can adapt over time as more information becomes available.

30. We will be able to consider at scheme review points how uptake, generation and costs compare to our modelling predictions, which will enable us to make improvements and modifications to the modelling accordingly. We will similarly update scheme impact assessments following reviews.

Recap of consultation lead scenario

31. Four tariff-setting approaches were considered for the FITs consultation:-

1) “8% ROI”
2) “non-microgen”
3) “community”
4) “lead scenario”

32. The “8% ROI” scenario provided the most generous tariffs of the scenarios modelled, giving an 8% return on investment to all technology types and technology scales. It was the most costly of the scenarios modelled (both in absolute terms and also in £/MWh terms).

33. The “non-microgen” scenario provided relatively low tariff levels and hence only encouraged uptake of the cheaper technologies close to the 5MW FITs capacity limit. Though this option had the lowest cost of the scenarios modelled, it incentivised minimal uptake of domestic-scale and community-scale installations and hence failed to achieve some of the key objectives of the FIT scheme.

[11] For further detail on projected technology costs over time, please see Quantitative Analysis of the Design of Feed-in Tariffs http://www.decc.gov.uk/en/content/cms/consultations/elec_financial/elec_financial.aspx
[12] Note that any individual installation, once starting to receive a tariff at a certain level, will continue to receive the same generation tariff level (adjusted for inflation) throughout its entire support period under the FIT scheme.

34. In order to incentivise engagement by households and communities, and to incentivise a more diverse range of technologies, a “community” scenario was modelled which offered more generous tariffs to technologies such as domestic PV and small wind (reflecting the higher generation costs of these installations). This scenario delivered more on the scheme’s objectives, however the tariff levels were chosen relatively arbitrarily and were heavily dependent on refinements made in response to the modelling outputs.

35. This therefore led to a ‘rate of return’ approach being considered which provided a more methodical/logical approach to tariff-setting by offering an approximate 5-8% return to all technology types and technology scales. This rate of return approach avoids the potential problem of ‘picking winners’ under the previous scenario and is also consistent with best practice seen in other countries. This “lead scenario” delivered a mix of technologies and technology scales using a rate of return approach. It was chosen as the recommended option at the time of consultation as it provided the best overall balance between delivering the scheme’s core objectives (including contributing to the UK’s renewable energy target and enabling greater participation by households, businesses and communities in the renewable energy agenda) whilst having consideration for scheme costs.

36. The consultation lead scenario provides an approximate 5-8% return on investment, with tariffs being banded according to technology type and scale (in order to be cost-reflective and to avoid over-subsidising). Consideration is given to reflect technology-specific risk and ease of deployment e.g. PV tariff levels provide an approx 5% ROI given that PV is easier to deploy than other technologies and carries less risk to the investor since it is a tried and tested technology. In setting a 5% ROI for PV, the relatively high generation cost of PV (measured through a £/MWh[13] cost-effectiveness metric) and the potential impact of this on overall scheme costs and hence energy bills has also been taken into account.

37. Tariffs for installations towards the 5MW capacity limit are adjusted where necessary to ensure consistency with existing support under the RO and to avoid perverse incentives of downsizing below the 5MW level in order to gain from higher support levels under the FIT. For further information on the consultation lead scenario and the other scenarios modelled at the time, please see the Consultation Impact Assessment[14].

38. The consultation lead scenario delivers approximately 2% of final electricity consumption in 2020 (i.e. approx 8TWh in total) through sub-5MW renewable technologies.

Scenarios modelled

39. Three main scenarios are covered in this final impact assessment. The scenarios modelled are as follows[15]:-

- Option 1: Core refinements to consultation lead scenario
- Option 2: Further refinements to consultation lead scenario
- Option 3: 8% ROI

40. The costs and benefits[16] of these scenarios are assessed for the TWh generation brought on by FITs over and above the 3TWh generation (in 2020) that would be expected to occur anyhow under the RO in the business-as-usual. Although the 3TWh in the BAU may in practice occur under FITs (as explained in para 57), this approach is

[13] Relative £/MWh levelised costs of different technologies/technology scales are shown in Figure 5 of the Element Energy quantitative report http://www.decc.gov.uk/en/content/cms/consultations/elec_financial/elec_financial.aspx
[14] http://www.decc.gov.uk/en/content/cms/consultations/elec_financial/elec_financial.aspx
[15] Please see Annex A for tariffs modelled under each scenario.
[16] Note that modelling of costs and benefits in this IA has taken place using 2008 prices, discounted.

taken given that the costs associated with the BAU 3TWh would be incurred regardless of whether FITs are implemented.

41. It should be noted that since the consultation, a number of modelling updates have been made as follows:-

- *Updated price projections*

  - Since the consultation took place, there have been updates to DECC's projections of electricity, gas and carbon prices to reflect latest available evidence. These price projection[17] have been used for the analysis undertaken in this impact assessment.

- *Suppliers administration costs*

  - Electricity suppliers will incur costs of implementing the FITs scheme. They are expected to pass these costs onto the electricity consumer (as is the case with the generation and export tariff costs). These costs had not been assessed at the time of the consultation but have now been estimated and incorporated within our cost projections. Further information on scheme administration costs are given in para 94.

- *Import savings*

  - In the analysis undertaken for the consultation, the estimated bill savings to generators were incorrectly fed through as a cost to consumers. This has been corrected for the analysis carried out in this IA i.e. estimated bill savings are not assumed to incur a cost to consumers in the way that the generation and export tariffs incur a cost to consumers.

Option 1: Core refinements to consultation lead

42. Option 1 builds on the consultation lead scenario i.e. it uses the same 'rate of return' tariff-setting approach. However, following the consultation and further analysis, core refinements to the consultation lead scenario have been made to reflect necessary changes as set out below. All the changes are viewed as necessary changes that are required to maintain the policy consulted on and to ensure the proper functioning of the scheme from launch in April 2010.

- *Updated assumptions for exported electricity*

  - The consultation lead scenario assumed that exports of FITs-incentivised sub-5MW electricity have a value equivalent to the wholesale price of electricity (approx 6p/kWh). This implies that an export tariff set at 5p/kWh would be self funding since this guaranteed export tariff is lower than the projected wholesale price over time (it in fact implies a lowering of overall scheme costs if suppliers were to pass on this 'benefit' to end electricity consumers).

  - Feedback received through the consultation process and independent analysis undertaken by the Department suggests that the value of exports to suppliers is unlikely to be reflected accurately in the wholesale price of electricity. The value to suppliers is likely to be lower than the wholesale price given the intermittent nature of small-scale generation, export metering costs and given the costs incurred in entering numerous small amounts of exports into

[17] For updated energy price projections please see http://decc.gov.uk/en/content/cms/statistics/projections/projections.aspx
For updated carbon price projections please see http://www.decc.gov.uk/en/content/cms/what_we_do/lc_uk/valuation/valuation.aspx

balancing and settlement. This would have a number of potential impacts: it would be necessary to compensate suppliers through the levelisation [18] process for the additional cost of buying electricity at above market rates. Furthermore it would potentially discourage suppliers and others from entering the market to buy electricity from small scale generation, as they would not be able to compete against artificially high prices.

- It is difficult to attach a single value to electricity exported under the FITs regime, as the value of exports could vary significantly depending on technology type and technology scale e.g. the intermittent nature of wind may make each kWh of export less valuable than a kWh of exported electricity using hydro. However, attempting to use a set of different export values would complicate the administration of the scheme (and there is currently insufficient evidence to underpin this approach). Therefore a value to electricity suppliers of 3p/kWh for exported electricity under FITs has been assumed to provide a more accurate representation of the value of exports to suppliers than the wholesale price[19].
- It should be noted that the value of exported electricity under FITs may be of relatively low value particularly at the start of the scheme given the immaturity and small size of the market. However as uptake under FITs increases over time, suppliers are likely to be incentivised to develop ways to better realise the value of the exported electricity e.g. by creating improved models of dispatch for intermittent small generators and developing more efficient systems for carrying out settlement and billing. The roll-out of smart meters would also facilitate the metering requirements of FITs and hence better enable the value of the exports to be realised. As numbers of small generators increase, costs to the suppliers of dealing with small-scale exports should reduce via economies of scale.

- *Reduction of export tariff & compensating increase in generation tariff*
  - Given that the assumed value of exported electricity to suppliers has been revised downwards from the wholesale price (approx 6p/kWh) to 3p/kWh, the export tariff for generators (which is intended to reflect the value of exports to the supplier) has been reduced from 5p/kWh to 3p/kWh. Generation tariffs have correspondingly been increased to compensate (the generator) for the fall in the export tariff so that target ROI levels as proposed in the consultation lead are maintained.
  - Generation tariffs for tariff bands that smooth to the RO (i.e. the largest tariff band for wind, hydro and AD) have not been adjusted but have been left at values that reflect subsidy received under the RO (so as not to encourage perverse incentives of downsizing to benefit from higher FITs subsidy). These larger installations are also able to opt out of the 3p/kWh export tariff and negotiate a price for their exports in the open market (as they are able to do under the RO).
  - The result of assuming both a 3p/kWh export value and a 3p/kWh export tariff is that payment of an export tariff is assumed to have a net zero impact on the scheme's costs to consumers.

[18] See Government Response to the FITs consultation for further information on the scheme's levelisation process. In short the levelistion process is aimed at ensuring that the scheme's costs are passed through evenly amongst participating suppliers (according to suppliers' market shares).

[19] Note that for sub-5MW electricity generated under the RO, the assumed value of exports to suppliers is given by the wholesale price i.e. approx 6p/kWh. The rationale for RO-incentivised exports having a higher value to suppliers than FIT-incentivised exports is that the RO mainly incentivises installations far in excess of the 5MW FITs capacity limit which will provide more value to the supplier than numerous amounts of small exports e.g. from domestic PV or micro-wind installations.

- Forcing suppliers to pay a fixed export tariff that yields greater costs to them than benefits (as the 5p/kWh may have done) could lead to perverse incentives and create distortions in the market. Imposing an export tariff greater than the value of exports would result in suppliers bearing disproportionate costs of participating in the FIT scheme since the export tariff will not be allowed into the levelisation process. This would also risk electricity consumers bearing disproportionate costs when the aim is for costs to be spread evenly.

- *Removal of biomass from FITs*

    - The proposed FIT scheme does not have any accreditation requirements for fuel or equipment. Accreditation would have to be designed in order to include biomass which would significantly increase the project cost and would be unrealistic within the current timeframe. Furthermore there is no requirement under the proposed FIT scheme to report on sustainability of biomass feedstock. Developing adequate reporting standards within FIT is likely to be a costly exercise and we judge is unfeasible in the given timeframe.

    - Air quality concerns arising from the deployment of small-scale biomass installations need to be recognised within an incentive scheme for small-scale renewable electricity generation. This issue has not been reflected in the proposed FIT scheme

    - Therefore, FITs will not be available for biomass plants. It must be noted that there would still be uptake of biomass plants within the RO.

43. Following these revisions and updates to the consultation lead scenario, Option 1 is projected to deliver approximately 850,000 renewable installations by 2020, generating approximately 3TWh of additional (to the baseline) small-scale low carbon electricity in 2020 at a resource cost of £600m in 2020 (annual), £8.8bn cumulative to 2030.

Option 2: Further refinements to consultation lead

44. Option 2 builds on Option 1 with its approach to tariff-setting and core refinements. This option however aims to further improve the effectiveness of the scheme and to further support engagement by communities in the scheme.

45. Adjustments have been made to refine the tariff bandings for wind, hydro and anaerobic digestion following feedback from the consultation:-

- ***Revised banding for Wind & Hydro***

- Further examination of the banding structure in the consultation lead scenario highlighted several issues for wind and hydro. In particular, insufficient granularity of the original tariff bands, particularly at the community-scale (e.g. 500kW to 2MW) could create perverse incentives to under-size investment (in order to take advantage of higher tariff levels in preceding bands) which could result in reduced cost-effectiveness of the scheme.

- Therefore more refined banding has been modelled in order to both encourage greater uptake of community-scale projects and to prevent prospective investors from downsizing to smaller bands. The revised banding essentially helps to smooth the transition from high (low-capacity installation) tariffs to the RO equivalent tariffs offered at higher capacities.

- Feedback on technology cost assumptions has also led to amalgamation of some of the tariff bands. The latest tariff bands and tariff levels better reflect costs than at the time of the consultation.
- The tables below show the changes that have been made. Particular attention should be given to how the tariff bands have been changed and it should be noted that tariff levels have been revised both to reflect the new bands (and technology cost information) but also to reflect the adjustments to generation tariffs as a result of the lowering of the guaranteed export tariff from 5p/kWh to 3p/kWh (as explained in para 42).

Wind:

Band (Wind)	Bands proposed in consultation document	Tariffs proposed in consultation document	Revised bands	Tariffs as in government response
1	0 – 1.5kW	30.5	0-1.5kW	34.5
2	1.5 – 15kW	23.0	1.5-15kW	26.7
3	15 – 50kW	20.5	15-100kW	24.1
4	50 – 250kW	18.0	100-500kW	18.8
5	250 – 500kW	16.0	500-1500kW	9.4
6	500 – 5000kW	4.5	1500-5000kW	4.5

Hydro:

Band (Hydro)	Bands proposed in consultation document	Tariffs proposed in consultation document	Revised bands	Tariffs as in government response
1	0 – 10kW	17.0	0-15kW	19.9
2	10 – 100kW	12.0	15-100kW	17.8
3	100 – 1000kW	8.5	100-2000kW	11.0
4	1000 – 5000kW	4.5	2000-5000kW	4.5

- Accordingly, a 500-1500kW band has been created for wind to capture owners with little or no expertise in the UK electricity market and who therefore require higher returns (than those in the final band receiving ROC equivalent levels) in order to participate in the scheme. The banding structure in the consultation would have rewarded community-scale schemes with the same level of remuneration as in the RO (insufficient to encourage significant uptake).

- Likewise, banding for hydro has been refined (i.e. the proposed consultation band for hydro of 1-5MW has been amended to 2-5MW) to incentivise deployment of community-scale schemes (1-2MW), owners of which do not tend to have professional experience in the market and so require higher tariffs than provided under the RO.

- Improved returns in these ranges (compared to those proposed in the consultation) would deliver larger community-based projects which are more cost-effective than projects below 500kW/1MW. The revised bands and tariff levels also try to smooth transition between FITs and RO support by providing more distinction between different bands of technologies. This should also reduce the incentive for developers to downsize the capacity of projects to benefit from higher tariff levels.

- ***Revised banding for Anaerobic Digestion***

- This scenario removes the distinction between electricity-only and CHP AD that was present at the time of the consultation. Consequently, different levels of support are introduced according to size, where tariffs have been banded to provide a greater level of support to smaller farm-scale AD (less than 500kW), reflecting the higher costs that would be incurred by these generators.
- The consultation FITs proposal did allow for a tariff to support on-farm AD. However AD installations at this scale had not been included in the modelling/analysis due to lack of data. AD technical potential mainly accounted for large-scale urban food waste based plants. Information received during the consultation has now enabled us to include on-farm AD in our current modelling.

- The tariffs for AD concentrate on the subsidy provided for electricity generation. It is recognised that AD plants may operate in CHP-mode as well as electricity-only mode. Ongoing development of the Renewable Heat Incentive scheme (due to be implemented in April 2011) will give consideration to any prospective subsidy for heat generated by AD CHP plants in order to encourage the most optimal configurations for AD plants.

- ***Delayed degression***

- In the consultation, we proposed that degression for certain technologies/technology scales would apply from 2011. Feedback from industry has highlighted concerns that cost reductions on which degression rates were based could not be delivered until the industry has had the opportunity to gear up and deliver sizeable volumes of kit. This leads to concerns that our modelled cost reductions may not be delivered initially, so we have looked at delaying degression by a year to minimise the risk of uptake being lower than expected in early years. We will delay degression until 2012, whilst increasing degression rates in later years to compensate.

- In order to encourage further cost efficiencies from the solar photovoltaic industry, whose products will make up the majority of installations supported under FITs and whose costs per kilowatt hour of electricity produced are the amongst the highest under the scheme, we propose at this stage to increase the degression rate by a further 0.5% from 2015. This gives a clear indication to the industry of Government intent, although the first review period will be an opportunity to consider whether this increase should be maintained, or indeed increased as may be required should the cost reductions that the industry have delivered historically be continued or improved.[20]

- ***MicroCHP pilot***

- Non-renewable microCHP has the potential to deliver significant carbon savings, with significant cost reductions expected over time if the product reaches mass market. As a simple 'boiler replacement' technology, it could play an important role in meeting our carbon objectives as part of comprehensive low carbon solutions for housing and other buildings.

- It is expected to deliver carbon savings in the form of avoided carbon emissions from combined heat and electricity generation which is less carbon intensive than a mixture of a gas boiler and grid electricity.

- Due to the significant carbon-saving potential of this technology, a tariff of 10p/kWh will be provided to domestic-scale (sub-2kW) microCHP. Installations at this scale will also have access to the export tariff (3p/kWh).

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[20] For example the European PV Industry Association (EPIA) state that the cost of solar energy has dropped by an average of 10% per year (http://www.epia.org/solar-pv/faq.html#c3998) and some commentators forecast "grid parity" for solar PV by 2013, e.g. http://www.solarcentury.co.uk/Press/Press-Releases/Solar-electricity-as-cheap-as-conventional-electricity-in-UK-by-2013

- The proposed tariff level is based on data from Stirling, Organic Rankine Cycle and Fuel Cell engines. The generation tariff has not been banded according to technology type in order to incentivise uptake of the most cost-effective and efficient technology types.

- The tariff has been set bearing in mind uncertainty of assumptions, potential perverse incentives such as heat dumping[21] and the intention of not creating direct competition for uptake of other renewable technologies. The generation tariff has not been assessed according to the return on investment provided as for other technologies within the Feed-in Tariff scheme due to the variety of microCHP products and uncertainty in assumptions.

- Performance, cost and uptake rate assumptions for the technology are highly subjective due to lack of robust data and the widely varied estimates provided by manufacturers. Accordingly, uptake and cost projections vary significantly depending on assumptions made in modelling.

- Given such uncertainty, it is proposed that support under FITs for domestic-scale microCHP will be capped at 30,000 installations. Implementation of a cap aims to manage upside risks to scheme costs. Costs however may be lower than projected should deployment and generation not reach expected levels.

- This is projected to lead to costs to consumers of £60m cumulative to 2020. Support will be reviewed once the 12,000th plant has been installed or at the general Feed-in Tariff scheme review, whichever is earlier.

- MicroCHP installations that are incentivised through the FITs scheme will be accredited under the MCS scheme. As part of this, the environmental performance of the installation will be evaluated and compared with that of a boiler (with a SEDBUK efficiency of 86%) using the same fuel. The environmental performance of the microCHP installation must be equivalent to or better than would be achieved by the counterfactual boiler. This will ensure that only those installations which deliver real carbon savings will be supported by FITs.

- Larger microCHP installations could compete with non-CHP technologies through their carbon saving potential and policies to encourage and require greater carbon efficiency from organisations. Support for microCHP up to the capacity (50kW) allowed through the Energy Act will be kept under review alongside other carbon saving policies and incentives.

46. Option 2 is projected to deliver approximately 750,000 renewable installations and 30,000 domestic microCHP installations by 2020, generating approximately 3TWh of additional (to the baseline) small-scale low carbon electricity in 2020 at a resource cost of £570m in 2020 (annual), £8.6bn cumulative to 2030.

[21] For a given heat demand and electrical output, lower levels of heat generation allow for longer operating hours. Greater carbon savings can be made from generating the same heat output. Generally speaking, as heat to power ratios fall, electrical efficiency increases. Less gas is required for a given electrical output in systems with lower heat to power ratios. Therefore it becomes less expensive to use these systems for electricity generation only and therefore produce ‘waste heat’. Tariff levels set above the threshold at which the income stream from the tariff is equivalent to the marginal cost of producing electricity may create perverse incentives to heat dump.

However, prospects of heat dumping will vary across households and products. Households with high heat demands will be able to utilise all heat produced whilst product types may not deliver sufficient levels of heat at any given moment for there to be enough heat to ‘waste’. Given the lack of evidence available, tariff levels have been set to achieve a balance between the intention of reflecting technology costs and avoiding creating perverse incentives.

Option 3: 8% ROI

47. The 8% ROI scenario sets tariffs at a level which would provide an 8% return on investment (ROI) to all investors, across all technologies, all scales and all resource levels (e.g. across wind speeds and solar insolation levels which vary by site location). In practice such a menu of tariffs would be very difficult to administer since the tariff level would have to vary from installation to installation. This scenario is therefore not considered to be a realistic deployment option for FITs, but nonetheless provides an illustration of the potential costs and benefits of such a tariff-setting approach. Under the scenario, the vast majority of installations are projected to occur at the household and commercial level – this is because some individuals in these investor groups are thought to be willing to accept a relatively low rate of return. The generation mix under this scenario is dominated by solar PV, as this technology has a very large technical potential and is widely available to household and commercial investors.
48. As PV is a relatively high-cost of generation technology (£/MWh), overall costs (both resource costs and costs to consumers) are significantly higher when compared to the other scenarios.
49. It should be noted that as rates of return are increased, costs to consumers will increase both due the fact that the associated higher tariffs yield higher uptake levels, but also because those generators who were already willing to invest at lower rates of return are now provided with excess rents (reducing the cost-effectiveness of the scheme).
50. Non-renewable domestic microCHP has not been modelled in this scenario since microCHP is assessed off-model.
51. Option 3 is projected to deliver approximately 2,750,000 renewable installations (of which 1,880,000 are PV installations) by 2020, generating approximately 6.5TWh of additional (to the baseline) small-scale low carbon electricity in 2020 at a resource cost of £1.6bn in 2020 (annual), £20.9bn cumulative to 2030.

Chosen Option – Option 2

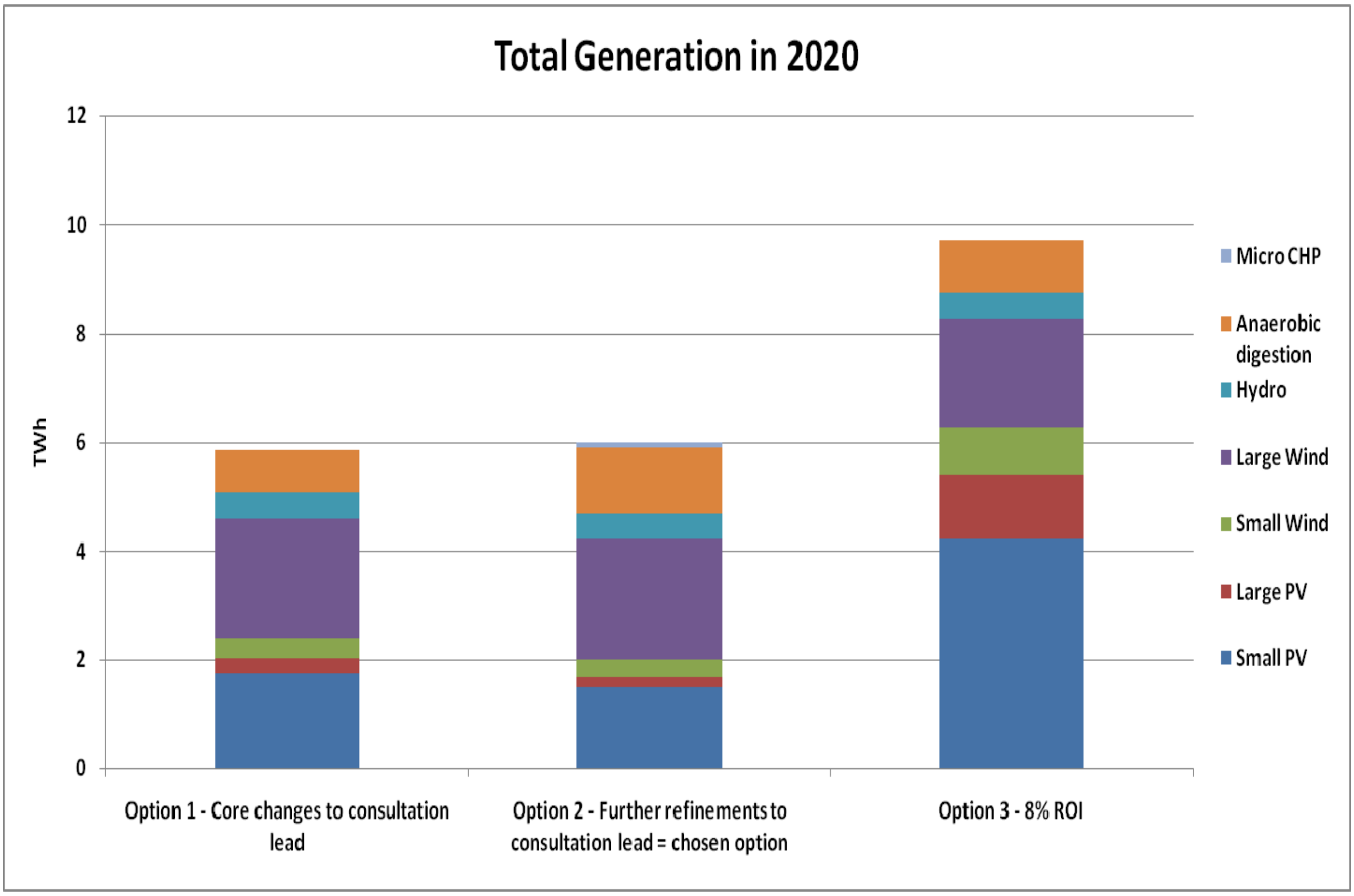
52. Option 3 has been chosen as the recommended option as it achieves the best overall balance between delivering policy objectives, including engaging households and communities in the climate change and renewable energy agenda through providing them with a reasonable but not excessive rate of return, whilst limiting overall costs of the policy to a level that is deemed acceptable. This schedule of tariffs is projected to deliver a wide range of technologies which will allow competitive markets to develop, driving innovation and bringing down costs into the future. Tariffs have been proposed at such a level that significant numbers of householders, communities, businesses and public sector organisations will have the opportunity to become producers of renewable electricity, bringing electricity generation into the public arena and fostering behavioural change.

Results

Key costs and benefits

53. Figure 1 illustrates the total generation mix that is delivered under the three modelled scenarios (inclusive of baseline/BAU generation). All options deliver a diverse balance of technologies and incentivise uptake at the household and community scale[22].

Figure 1 – Technology mix under different scenarios



*Generation levels in Figure 1 are inclusive of baseline generation.

*Generation under Option 2 includes low carbon generation from domestic-scale microCHP installations.

54. Option 2 (chosen option) is projected to deliver approximately 1.6% of final electricity consumption in 2020 (i.e. approximately 6TWh in total, approximately 3TWh additional to the baseline) through sub-5MW low carbon technologies. Support for small-scale biomass will be maintained under the Renewables Obligation and hence overall small-scale low carbon generation will contribute approximately 2% of final electricity consumption in 2020.

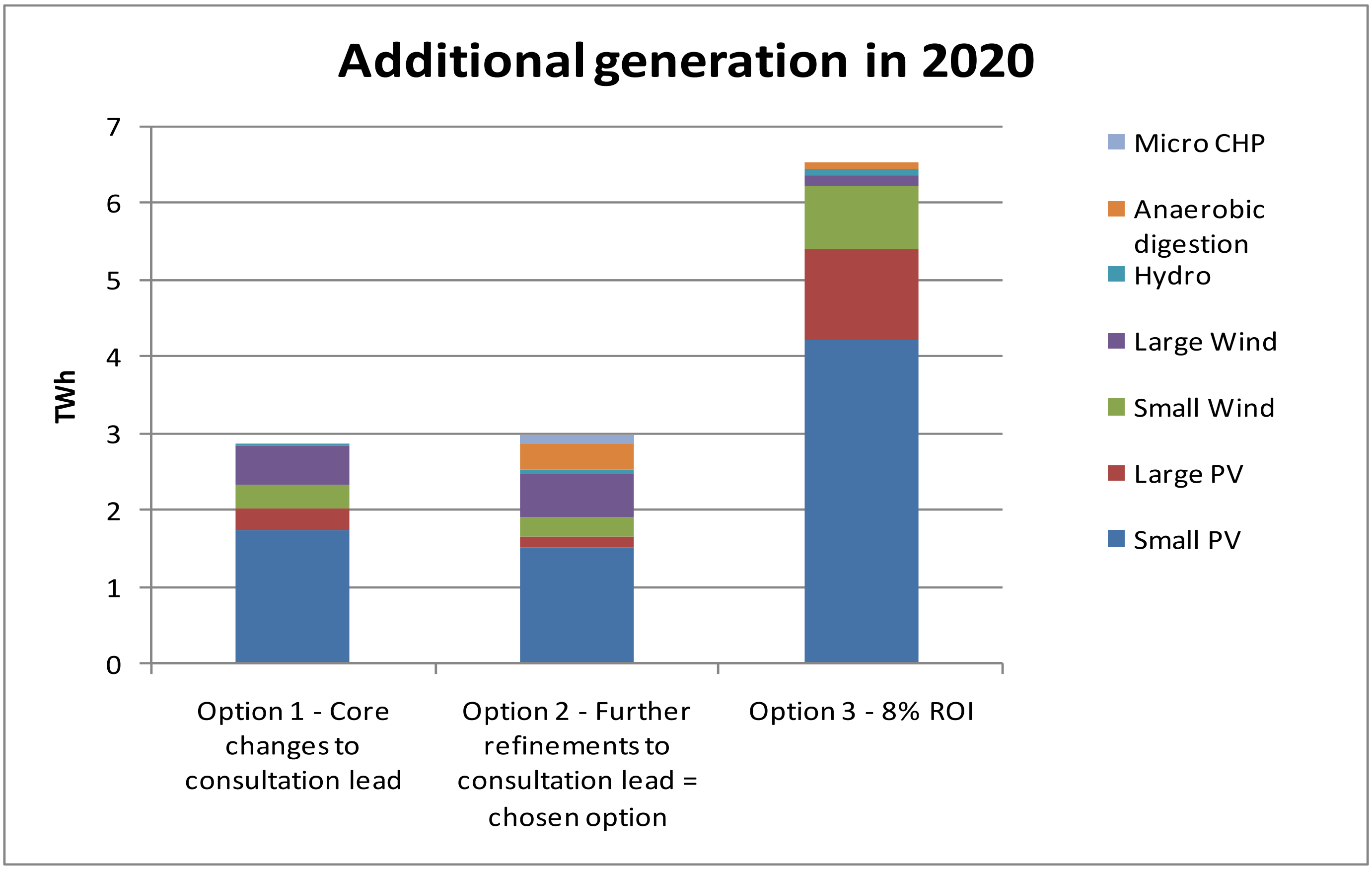
55. Option 2 delivers more generation compared to Option 1 from anaerobic digestion due to revised banding and greater support for on-farm AD, whilst delivering less generation

[22] Generation from small-scale biomass that was previously modelled under FITs for the consultation is expected to occur under the RO. Consequently, biomass generation and costs have not been presented in this IA.

from small and large PV as a result of steeper degression. Options 1 and 2 deliver broadly the same levels of generation from wind and hydro. Whilst revised banding in Option 2 initially increases uptake of these technologies, further changes to the degression profile in Option 2 somewhat offsets this change.

56. Option 3 delivers almost 10TWh of generation in 2020, however nearly half of this generation is dominated by small PV, which is one of the most expensive (£/MWh) technologies/technology scales covered by FITs. As set out further below, costs would increase disproportionately to the increase in TWh thus reducing the overall cost-effectiveness of the scheme.

Figure 2 – Technology mix (additional to the baseline)



*Generation levels in Figure 2 are additional to the baseline

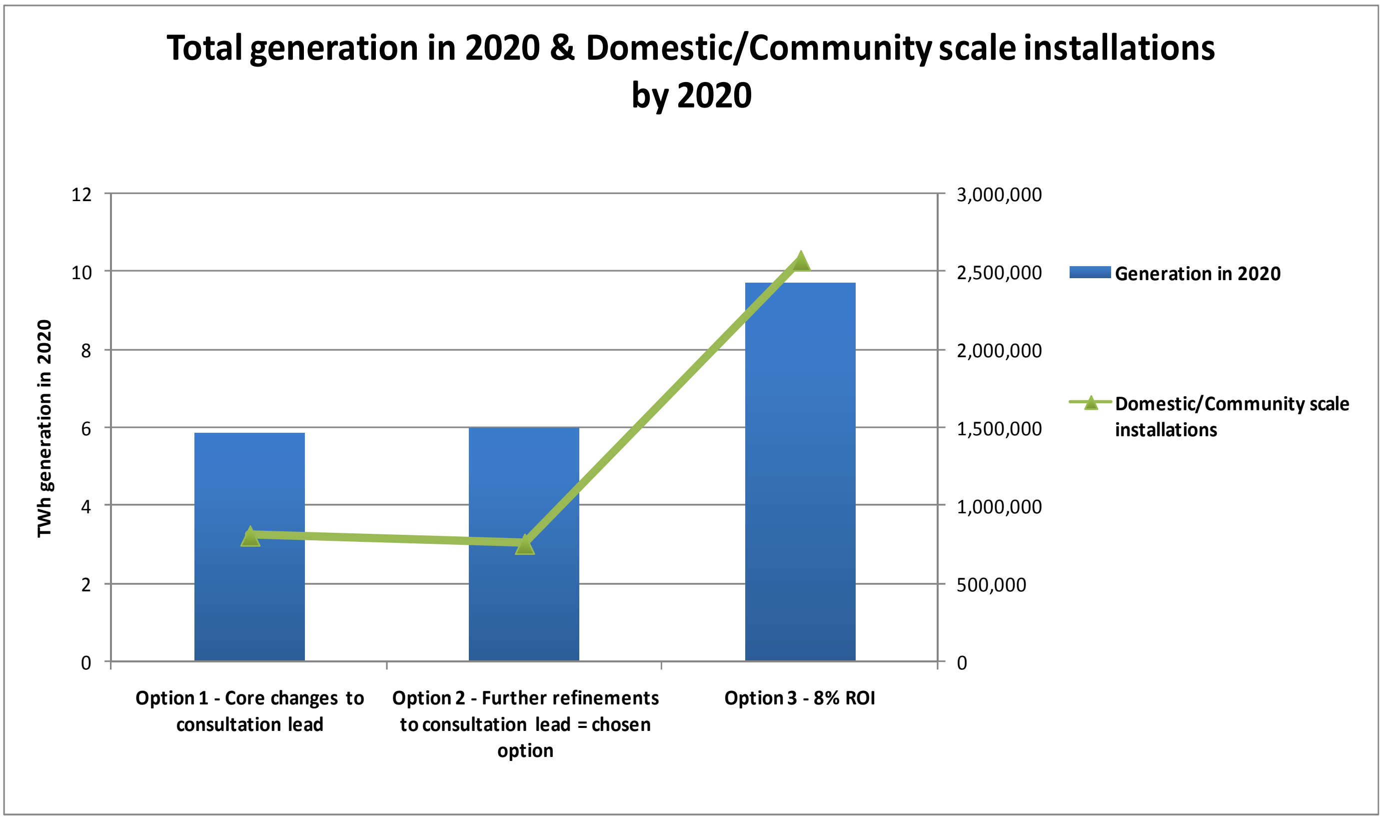
*Generation under Option 2 includes low carbon generation from domestic-scale microCHP installations.

57. Since baseline/BAU generation could in reality occur under the RO or under FITs, it is worth looking at how much additional-to-baseline generation is brought on by FITs (as illustrated in Figure 2). This should not detract from the fact that the baseline generation could occur under FITs rather than the RO given that FITs provides greater certainty of investment than the RO, investors are no worse off than they would be under the RO (and in fact in most cases are better off given the FIT tariff levels) and given that FITs (both generation and export tariff) will be index-linked.

58. Under Option 1, more than half of additional-to-baseline generation is delivered by PV. Generation delivered by PV falls in Option 2 due to steeper degression rates. Option 3 delivers almost 6TWh of additional-to-baseline generation in 2020, however more than

three quarters of this is dominated by PV, which is one of the most expensive (£/MWh) technologies covered by FITs.

Figure 3 – Generation levels in 2020 and domestic/community scale installations by 2020



*Generation and installation numbers are presented as inclusive of the baseline (there are 3TWh and approx 4,500 domestic/community scale installations in the baseline).

*Numbers of domestic/community-scale installations are approximations, based on projected domestic PV, micro-wind and small wind installations (and domestic microCHP installations for Option 2).

59. Figure 3 highlights total projected low carbon generation by 2020 and the difference in numbers of domestic/community scale installations incentivised under each scenario. Option 3 delivers approximately 2.6 million installations at this scale since this scenario offers a more generous schedule of tariffs that brings on a significant number of installations at this size. Options 1 and 2 are broadly similar and deliver over 0.75 million installations at the domestic/community scale.

Table 1 – Summary of costs and benefits

	Option 1 - core refinements to consultation lead	Option 2 - further refinements to consultation lead = Chosen Option	Option 3 - 8% ROI
Annual resource cost in 2020	£600m	£570m	£1.6bn
Resource cost in 2020	£220/MWh	£200/MWh	£250/MWh
Cumulative resource cost to 2020	£3.8bn	£4.1bn	£8.0bn
Cumulative resource cost to 2030	**£8.8bn**	**£8.6bn**	**£20.9bn**
Annual cost to consumers in 2020	£440m	£440m	£1.6bn
Cumulative cost to consumers to 2020	£2.8bn	£3.1bn	£7.8bn
Cumulative cost to consumers to 2030	**£6.4bn**	**£6.7bn**	**£20.7bn**
Cumulative tonnes CO2 saved to 2020	6m	7m	12m
Cumulative CO2 savings to 2020	£100m	£120m	£200m
Cumulative CO2 savings to 2030	**£400m**	**£420m**	**£930m**
Policy Net Present Value to 2020	-£3.7bn	-£4.0bn	-£7.8bn
Policy Net Present Value to 2030	**-£8.4bn**	**-£8.2bn**	**-£20.0bn**
Additional electricity generation in 2020	2.7TWh	2.8TWh	6.5TWh
Total electricity generation in 2020	**6TWh**	**6TWh**	**10TWh**

* Future costs and benefits have been discounted using the Green Book social rate of time preference (3.5%).

* Impacts are presented in 2008 prices and have been discounted to 2008.

* Impacts are presented as <u>additional</u> to the baseline.

* Figures have been rounded.

* Resource costs, costs to consumers, C02 savings and generation presented in Option 2 include non-renewable domestic microCHP.

*Cost to consumers is the <u>net subsidy cost</u> of the scheme i.e. total generation and export tariff payments minus the value of exports to suppliers.

60. Option 2 (chosen option) delivers approximately 780,000 low carbon installations at a resource cost of £200/MWh in 2020, and a cost to consumers of £3.1bn cumulative to 2020.

61. Resource cost in 2020 as measured by £/MWh has increased significantly from £100/MWh under the lead scenario presented in the consultation to £200/MWh under Option 2 (chosen option). This is primarily due to the removal of biomass from the scheme, which at the time of consultation was one of the most cost effective technologies modelled under FITs. Small-scale biomass however will continue to be supported under the RO.

62. Moving from Option 1 to Option 2 shows a marginal increase in electricity generation in 2020. This is partly due to constraints in the modelling[23], and in reality we would expect to see further benefits of revised banding for wind, hydro and anaerobic digestion (including benefits from avoiding the perverse incentives of down-sizing).

63. Option 2 has a lower resource cost in 2020 than Option 1 due to the change in the degression profile across the scenarios - steeper degression in Option 2 leads to lower uptake in 2020 which results in a fall in resource costs. Cumulative resource costs to 2020 increase when moving from Option 1 to Option 2 due to changes in uptake of anaerobic digestion, wind, hydro and microCHP.

64. Of the scenarios presented, Option 3 has by far the highest resource cost and cost to consumers, as it delivers the highest number of installations and the mix of technologies is dominated by solar PV which is relatively high-cost in £/MWh terms compared to the other technologies. Raising the share of PV in the technology mix also acts to increase the £/MWh cost of the scheme (effectively reducing the scheme's overall cost-effectiveness). This option delivers approximately 10TWh of renewable generation at a cost to consumers of £7.8bn to 2020. Compared to Option 2, Option 3 delivers a 67% increase in TWh whilst the cost to consumers to 2020 increases by 150%.

65. The carbon abatement benefits achieved under Option 1 and 2 are broadly similar, with Option 1 generating carbon savings valued at £100m and Option 2 generating carbon savings valued at £120m as a result of the refinements made for AD, wind, hydro and microcHP. Carbon benefits are valued at the traded price of carbon since renewable generation under FITs is expected to displace grid generation (which is covered by the EU ETS).

Further benefits of chosen option

Environmental benefits of Anaerobic Digestion

66. On-farm AD plants provide greenhouse gas benefits in the management of farm waste as well as through the generation of renewable energy, whilst being sound environmental practice. Additional benefits of farm-scale AD identified include on-farm waste management, methane control and soil management.

67. There are further significant environmental benefits of Anaerobic Digestion technology, which have not been quantified in this analysis. Those benefits include elimination of malodorous compounds, reduction of pathogens, production of sanitised compost, reduced dependence on inorganic fertilisers by capturing and reusing nutrients, reduced infiltration of nitrates in soil, use of recycled water, promotion of carbon sequestration and increased social acceptance.

microCHP

68. As a 'boiler replacement' technology which can be readily installed in many property types without major changes to the service infrastructure, it is expected that support

[23] Technical potential in the model has been allocated to various band sizes according to observed uptake by different technology scales under the RO. Once FITs is implemented, it is likely that more community-scale installations would be deployed than has been seen under the RO.

provided through Feed-in-Tariffs will target a key part of the population to engage consumers in the UK's carbon reduction efforts.

69. With the combination of market potential and investment in research & development undertaken by industry to date, the UK has the opportunity to gain comparative advantage in this area of the innovative low carbon technology sector.

70. Accordingly, there is potential for job creation within the industry. This will depend on market size , which will depend in part on the nature and level of the support offered, as well as a range of commercial factors, and the nature of the manufacturing process for the different technologies relative to conventional boilers. Estimates of employment potential and financial contribution to the UK economy within the micro combined heat & power industry have not been made in this impact assessment.

71. Carbon savings from microCHP units are derived from improved efficiency that is realised via the simultaneous production of heat and electricity from a given quantity of fuel and via onsite use which avoids transmission and distribution losses.

72. Technology cost reductions have not yet taken place as microCHP is an emerging technology; even so, cost-effectiveness indicators are comparable to those for the mix of renewable technologies expected to be incentivised under our chosen FITs scenario. The technology is still in early development stages and as products reach mass market, there is significant scope for technology cost reductions which would result in improvements in cost-effectiveness. Cost effectiveness figures have not been published as they are based on commercially confidential information provided by manufacturers.

Consumer costs

73. Policy costs in this IA are presented both in terms of resource costs and in terms of costs to consumers[24]. Resource costs are the additional cost to society of the policy – that is to say the additional cost of renewable generation incentivised by FITs relative to conventional generation (assumed to be gas CCGT). Costs to consumers / net subsidy costs on the other hand are the costs passed through to bill payers as a result of the levy placed on electricity suppliers to pay for the FITs.

74. Resource costs are calculated using a cost of capital which is assumed to be 10% across all investor types. However, in practice the take-up of FITs is likely to vary significantly among different groups – some people will value renewable technology highly, have access to capital and undertake investments at a hurdle rate[25] lower than 10%. Others will have much higher hurdle rates and will require much higher subsidies in order to be persuaded to invest. The uptake modelling explicitly models the likely distribution of hurdle rates across investor types, and uses this information to set the tariffs required for different levels of renewable deployment.

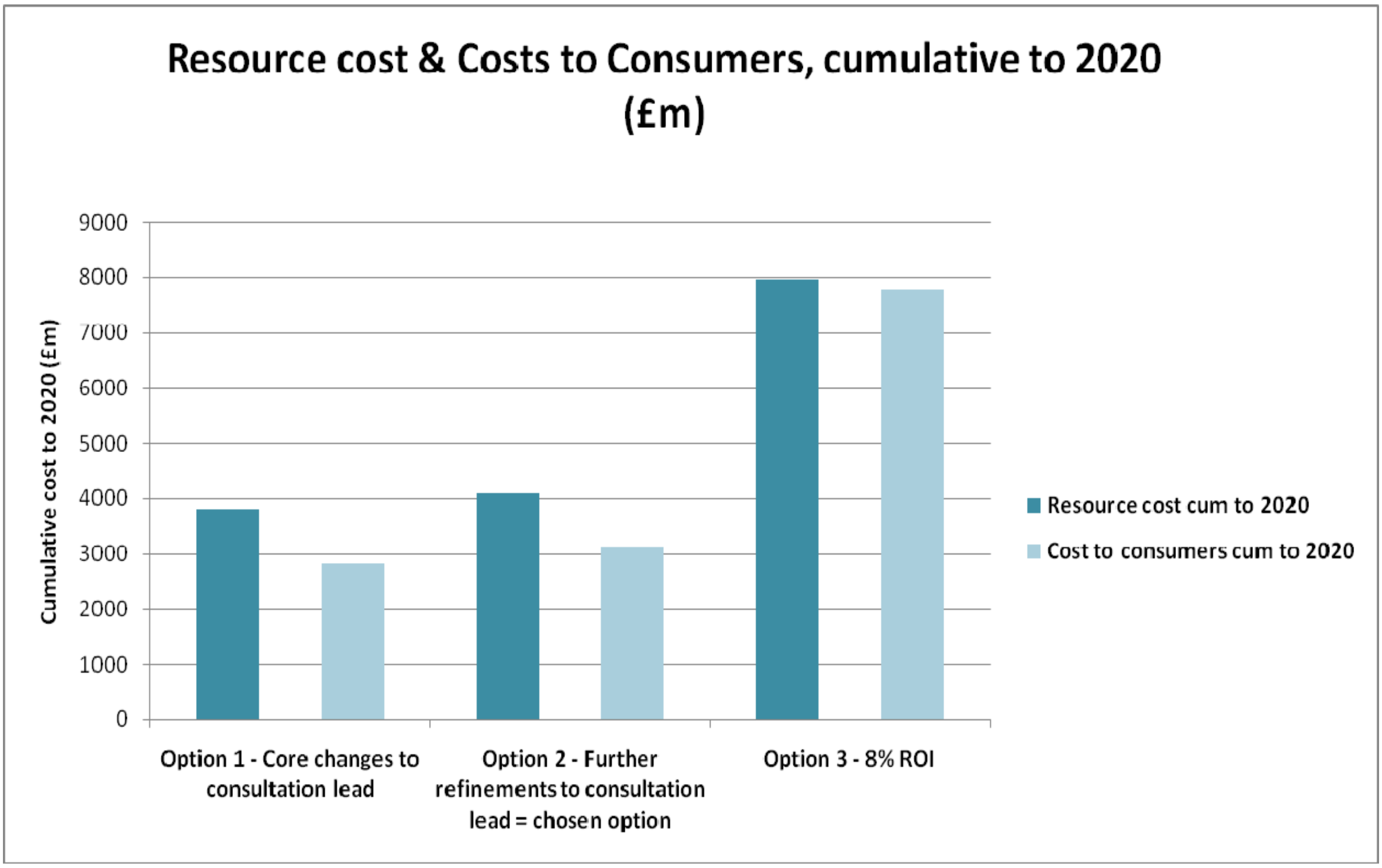
75. This results in overall subsidy costs being different from resource costs. Where deployment is concentrated among those investors with low hurdle rates, subsidy costs are likely to be lower than resource costs. This reflects the fact that there are some investors e.g. 'early adopters' who value renewable technology highly and are willing to invest at relatively low rates of return due for example to access to low-cost capital (such as savings) and due to other less tangible (i.e. non-financial) benefits ('green benefits') that they will receive from the investment. Where deployment is concentrated amongst technologies such as large-scale wind, and where tariffs are not altered to reflect resource availability, subsidy costs will tend to be higher than resource costs.

[24]The terms costs to consumers and subsidy costs are used interchangeably in this IA. Subsidy costs in this IA refer to net subsidy costs i.e. generation and export tariff payments minus the value of exported electricity to suppliers.

[25] A hurdle rate reflects the minimum rate of return that an investor will consider before taking up an investment opportunity.

76. Figure 4 illustrates the resource and subsidy costs incurred under each scenario as a result of the FITs payments received by investors of the small-scale low carbon technologies[26].

Figure 4 – Cumulative costs to 2020



77. Under all three scenarios, subsidy costs are lower than resource costs implying negative rents. This may appear counter-intuitive at first, but can be explained by the fact that these scenarios incentivise a significant level of domestic-scale installations (e.g. domestic PV), with investment in smaller scale technologies mainly attributed to investors with lower hurdle rates. This should not detract from the fact that investors, according to the Element Energy/Poyry model and its underlying assumptions, are still receiving sufficient (or more than sufficient) tariff payments to incentivise them to invest.
78. Furthermore, the impact assessment presents cost to consumers as net subsidy costs[27]. Gross subsidy costs (total generation plus export tariff payments) would bring subsidy costs closer to resource costs.

Impact on bills

79. Implementing a subsidy framework for small-scale low carbon electricity generation via a FITs policy will incur resource costs to the economy (£4.1bn cumulative to 2020 under the chosen option). Net subsidy costs (i.e. the costs to consumers identified in Table 1 above) will also be incurred (£3.1bn cumulative to 2020 under the chosen option). End

[26] This IA presents impacts at the macro level. Impacts at the micro level (for example tariff income to individual investors) will be highly dependent on a number of factors including technology type, technology scale, resource availability, onsite consumption levels, export of excess electricity and individual investor hurdle rates.
[27] Net subsidy cost = the cost of generation and export tariff payments minus the value of exported electricity to suppliers.

electricity consumers are expected to bear the subsidy costs given that FITs payments are to be paid by energy suppliers, who are then expected to pass these costs on to consumers via increased electricity bills. It is estimated that the chosen scenario would lead to an average increase in annual household electricity bills of approximately £8.50[28] (1.5%) for the period 2011-2030. Average annual industrial bills are projected to rise by around 1.5% over the same period.

80. The bill impacts under Option 3 are significantly greater than under the chosen option given that subsidy costs are significantly greater. Under Option 3, annual household electricity bills would rise by approximately £27.50 (4.8%) over the period 2011-2030

Table 2 – Impact on electricity bills, chosen option

Domestic bills

	Average bill impact	% impact
2015	£6.50	1.3%
2020	£10.70	1.9%
2011-2030	£8.50	1.5%

Industrial bills

	% impact
2015	1.3%
2020	1.8%
2011-2030	1.5%

* Bill impacts are presented in 2009 prices, undiscounted. Figures have been rounded.

<u>*Distributional impacts*</u>

81. Distributional impacts, including in respect of fuel poverty, will depend on a number of factors such as which groups take up and hence benefit from small-scale low carbon electricity generation, levels of electricity consumption, how electricity companies will pass on the policy/subsidy costs of FITs to different consumer groups through different tariff structures, and the potential for households to undertake energy efficiency measures to reduce their energy consumption and hence mitigate the impact of higher bills.

82. We do not have sufficient information to form a firm conclusion on these distributional impacts at this stage, but will assess distributional effects once the scheme is up and running and draw on this evidence at the time of the first tariff review.

83. The Government wants all households to have the opportunity to play a part in generating low carbon energy. Although feed-in tariffs will make payments over the life of installations, low-income households may still find it difficult to meet upfront costs. Building on the experience of pilot projects for Pay as You Save financing and Warm Front, the Government will consult later this year on measures to help low-income households take advantage of clean energy cashback.

[28] This is lower than the £10 estimated for the consultation, primarily due to removal of biomass from the scheme.

Installations

Table 3 – Cumulative installations to 2020 by investor type

	Option 1 - core refinements to consultation lead	Option 2 - further refinements to consultation lead = Chosen Option	Option 3 - 8% ROI
Domestic	799,000	744,000	2,556,000
Commercial	40,000	25,000	191,000
Developer	1000	1,000	0
Utility	2000	2,000	0

***** Installations shown here are additional to the baseline.

***** Numbers have been rounded.

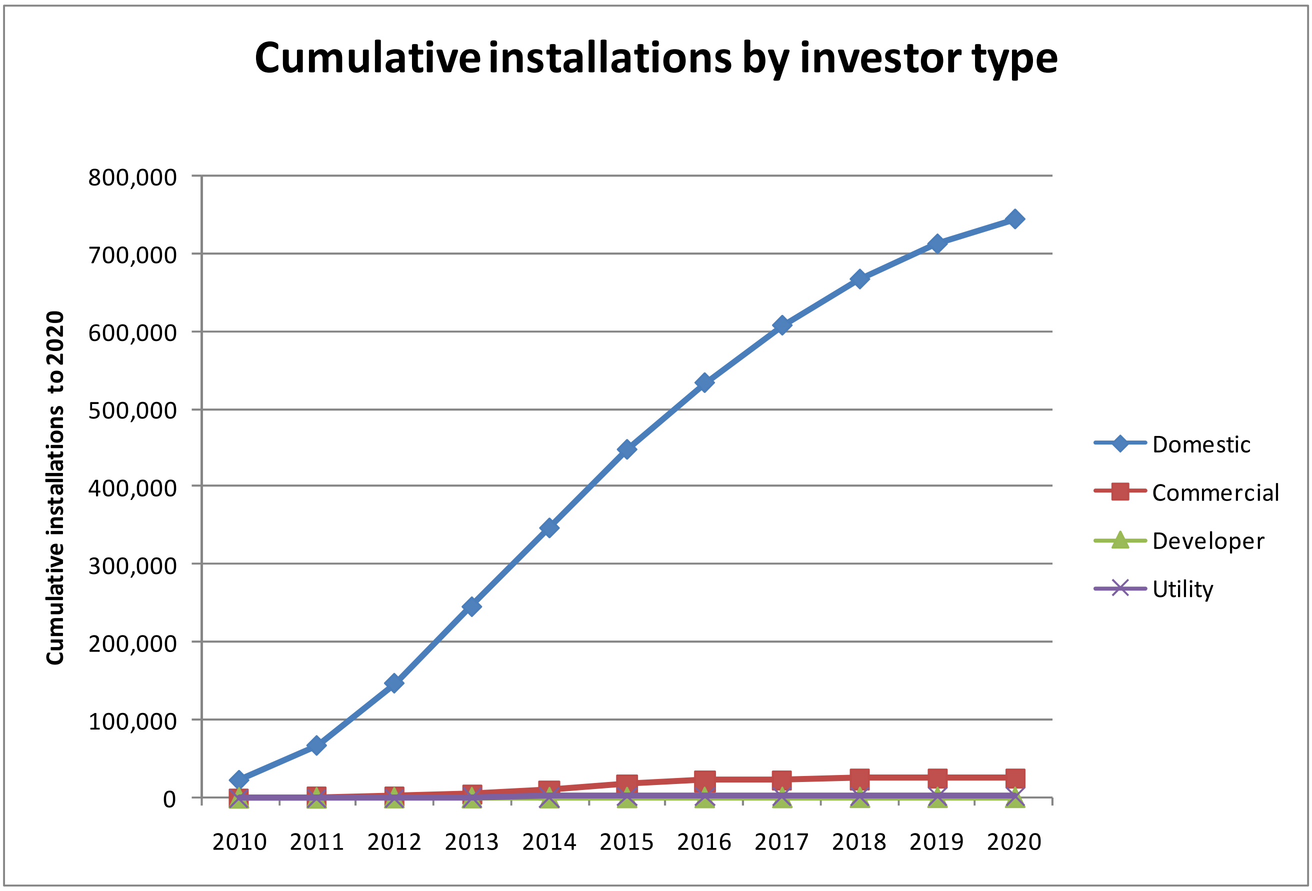
* Some installations attributed to developers/utilities may occur in household/commercial premises.

* Option 2 domestic sector uptake includes the 30,000 microCHP installations.

84. Table 3 shows, for each modelled scenario, the number of installations undertaken by each of the four investor groups modelled (domestic, commercial, developer, utility). The chosen scenario incentivises nearly 750,000 domestic-scale installations by 2020 and a smaller number of larger scale installations.

85. Figure 5 below illustrates the cumulative number of installations taken up by investor type over time for the chosen. Since this scenario has a focus on domestic/community-scale installations, it can be seen that there is uptake of a large number of (relatively small-scale) installations by the domestic sector over time, reaching nearly 750,000 by 2020.

Figure 5 – Cumulative installations by investor type, chosen option



*Installations are additional to the baseline.

Climate Change Policy Cost-Effectiveness Indicator

86. Cost-effectiveness analysis provides an estimate of the net social cost per tonne of GHG reduction resulting from the policy. Carbon savings under FITs are made in the traded sector. The cost-effectiveness indicator is given by:-

$$\text{Cost-effectiveness in traded sector} = \frac{\text{PV all costs - PV benefits in non-traded sector}}{\text{Carbon saved in traded sector}}$$

87. The resulting cost-effectiveness figures should be compared to the weighted average discounted (WAD) traded price of carbon to assess the cost-effectiveness for the climate change policy cost-effectiveness indicator[29].

88. Table 4 below indicates that carbon abatement under FITs is significantly more expensive than carbon abatement under the EU emissions trading scheme. The chosen option reduces emissions with a cost-effectiveness of £460 against a weighted average discounted traded carbon price of £24. However, other objectives of the policy including community engagement are also important.

[29] Further details on the WAD price of carbon can be found at: http://www.defra.gov.uk/environment/climatechange/research/carboncost/pdf/costeffect-psa-indicator6.pdf

Table 4 – Climate change policy cost-effectiveness

	Carbon cost-effectiveness (£/tCO_2)	WAD traded price of carbon
Recommended scenario	£460	£24

<u>*Scheme administration*</u>

Admin burden

89. As part of the Government's Better Regulation agenda, DECC is monitoring the impact of its regulations on business and taking initiatives to minimise the administrative burden they impose. An administrative burden is the cost to business of the administrative activities that it is required to conduct in order to comply with information obligations[30] imposed on it through central government regulation. This includes activities businesses have to perform in order to remain eligible for continued funding, grants and other applied for schemes, such as the FIT.

90. The UK has adopted the Standard Cost Model (SCM)[31] method of providing an indicative measurement of admin burdens and broadly relies on the following formula:

Activity Cost = Price X Quantity = (wage x time) X (population x frequency)

91. The time taken to complete an activity and the wage rate of the person undertaking the task are based on the figures for a normally efficient business. The population is given by the number of businesses affected; and the frequency is the number of times per year that business has to undertake the activity.

92. The estimated admin burden of the FIT tariffs will vary according to the population (the number of businesses that sign up to the incentive). The population used in these estimates is taken from the final scenario presented in this IA, and is expected to increase every year until 2020 as the level of renewable electricity deployed increases.

93. The admin burden is estimated to be approximately £18m cumulative to 2020 (note that following SCM methodology, admin burden figures are presented in 2005 prices, discounted).

Administration costs to suppliers

94. As foreshadowed in the REFI document, some allowance for implementation costs for suppliers will be included in the levelisation process to cover the unavoidable costs of administering FITs. The method for determining this amount will be set by the Secretary of State based on cost estimates provided by suppliers, and on the need to provide

[30] A duty to procure or prepare information and subsequently make it available to a public authority, as well as a duty to facilitate the collection or preparation of information by others, e.g. by permitting and cooperating with an audit, visit, or inspection. This includes regular requirements to read guidance and updated rules, for example rules which are updated annually. It is an obligation businesses cannot decline without coming into conflict with the law or being ineligible for continued funding, grants, and other applied schemes.

[31] http://www.berr.gov.uk/whatwedo/bre/policy/simplifying-existing-regulation/administrative-burdens/page44061.html

incentives to reduce costs to consumers. Discussions with suppliers are continuing on the level of the allowance and will be finalised before the start of the scheme.

95. An initial estimate of approximately £20m cumulative to 2020 for suppliers' admin costs has been incorporated in estimates of scheme costs presented throughout the impact assessment. These include costs of accreditation of sub 50kW generators, registration, metering costs, set up costs (i.e. IT systems development) and costs of providing data and information to Ofgem for the purpose of levelisation.

Administration costs of policy implementation

96. Ofgem will undertake the key central administrative functions for the scheme. These will include accreditation of generators that do not have access to the MCS system, administration of the Central FIT Register and administration of the levelisation process

97. Costs incurred by Ofgem have been not presented in this impact assessment as they will not enter the levelisation process. Consequently, these costs will not be passed on to consumers. Estimates will be published at the discretion of Ofgem in due course.

Sensitivities

98. As a new policy in which results presented above rely on several key assumptions underpinning the Element Energy/Poyry model (including on fossil fuel prices and discount rates), a level of uncertainty is attached to the modelled estimates. As with any model, projections will not necessarily be realised and actual deployment and cost levels may turn out to be different to those forecast by the model. The model projections should therefore be regarded as indicative of the possible impacts of FITs policy. Sensitivity testing has been carried out in order to provide a range of possible impacts around the central estimates for the chosen scenario (Option 2).

Fossil fuel prices:-

99. We have modelled the impact of different fossil fuel prices on resource costs for the recommended scenario. Results are shown in Table 5 below.

100. Under the lower bound[32] fossil fuel price scenario, overall uptake falls since the value of bill savings will be lower and hence rates of return would be less than under central fossil fuel prices. Subsequently, resource and consumer costs under this sensitivity scenario are also lower.

101. Under the upper bound[33] fossil fuel price scenario, there is greater deployment of renewable technologies as bill savings (and hence rates of return) are now higher than under central fossil fuel prices. Resource and consumer costs are therefore correspondingly higher.

102. It has not been possible for non-renewable micro-CHP to be included in this sensitivity test given that microCHP was assessed off-model.

[32] This reflects the "low energy demand" scenario – please see http://decc.gov.uk/en/content/cms/statistics/projections/projections.aspx
[33] This reflects the "high demand, significant supply constraints" scenario – please see http://decc.gov.uk/en/content/cms/statistics/projections/projections.aspx

Table 5 – Fossil fuel sensitivities

Change relative to baseline	Fossil fuel price scenario Lower bound	Upper bound
Annual resource cost in 2020	£490m	£590m
Resource cost in 2020	£170/MWh	£220/MWh
Cumulative resource cost to 2020	£3.7bn	£3.9bn
Cumulative resource cost to 2030	**£7.8bn**	**£8.8bn**
Annual cost to consumers in 2020	£400m	£450m
Cumulative cost to consumers to 2020	£2.9bn	£3.1bn
Cumulative cost to consumers to 2030	**£6.2bn**	**£6.8bn**

Discount rate:-

103. Central scenarios assume a discount rate of 10% (reflecting investors' cost of capital) when evaluating resource costs. For our recommended scenario we have modelled the impact of assuming higher discount rates of 16% for the domestic sector and 12% for the non-domestic sectors[34] to test the impact on resource costs of an increase in investors' cost of capital. As expected, a higher cost of capital leads to higher resource costs of the policy. Tariff levels are held the same under this sensitivity test and so cost to consumers and the value of carbon saved remain unchanged.

104. It has not been possible for non-renewable micro-CHP to be included in this sensitivity test given that microCHP was assessed off-model.

Table 7 – Discount rate sensitivity

	Sensitivity Discount Rates	**Central Discount Rates**
Resource cost (cum to 2020)	£5.6bn	£4.1bn
Resource cost (cum to 2030)	£12.2bn	£8.6bn

D. Implementation and Monitoring and Evaluation

105. This document sets out a high level indication of potential costs and benefits associated with implementing a Feed-in Tariff policy for small-scale low carbon electricity installations.

106. We will undertake periodic reviews of FITs with their timing to coincide with the Renewables Obligation reviews. Therefore, any changes to the scheme resulting from the first major review of FITs would be implemented in 2013, alongside any changes required to the RO following the proposed RO banding review, with a set programme of reviews thereafter. In the interim, the degression rates that we have set from when the scheme is launched will apply as set out in the schedule.

[34] The 16% and 12% discount rate sensitivity has been carried out to test the impact on resource costs of assuming the discount rates used in the Renewable Heat Incentive impact assessment.

107. If necessary, early reviews will be set up to consider any significant changes to the fundamentals affecting the operation of the scheme outside of the periodic review timetable. This approach is similar to the approach to early banding reviews under the RO.

108. All aspects of the FITs scheme will be subject to review including:

- tariff levels
- degression rates and methods
- eligible technologies
- arrangements for exports
- administrative and regulatory arrangements
- interaction with other policies
- accreditation and certification issues including the MCS.

109. Reviews will focus on whether the tariffs offered deliver the target returns, and whether those returns are appropriate in continuing to ensure a real contribution from small scale generation to our renewables and other targets, and that the scheme continues to deliver value for money.

110. In order to ensure that existing investors may proceed with certainty, any changes to future levels of support will apply only to investments following the review; generation tariffs the installations existing at the time of the review will be maintained. It is however our intention that the level of export tariff will be uniform across the scheme, it is therefore not possible to guarantee that the level of the export tariff will not change for individual installations.

E. Other considerations

Existing installations

111. Allowing all existing installations access to FITs would increase the overall costs of the scheme (potentially in the tens of millions) without encouraging additional generation. We do not believe that this cost to consumers would be justified. Therefore existing installations completed before 15 July 2009 that were not receiving support through the Renewables Obligation will not be able to access FITs, and those that were receiving RO support will get FITs at an equivalent level. Accordingly we will only allow new equipment to access FITs support, as it is on the basis of new technology costs that our tariffs are set.

Security of supply

112. Intermittency: FITs will deliver a mixture of intermittent (non-controllable) and dispatchable (controllable) technologies onto the grid.

113. Intermittent technologies (e.g. wind, solar PV) increase the complexity and risk involved in balancing the grid, avoiding power outages and forced curtailment. Greater generating capacity and/or demand side flexibility will be required to manage short-term fluctuations in the supply-demand balance. There will be associated costs and National Grid has set

out its views on this in its consultation “Operating the Electricity Transmission Networks in 2020”[35].

114. Dispatchable technologies (e.g. anaerobic digestion) have the potential to respond to price signals in the market – avoiding the grid management problems associated with intermittency. However, the incentive to do so will only exist if a premium tariff system is in place for these technologies. In contrast, if a fixed tariff system is in place then operators would have the same incentive to produce electricity at all times.

115. Generation mix: FITs have the potential to incentivise a diverse range of technologies and hence could increase generation diversity of the grid.

116. Fuel Imports: Increased renewables penetration in the electricity system will reduce our dependence on imported fossil fuels.

117. Grid resilience: A greater number of smaller electricity generating installations distributed around the country should increase the grid’s ability to withstand major interruptions.

Impact on small firms

118. Small firms who choose to install small-scale generation and claim FITs will benefit from the greater simplicity of the mechanism and from the greater certainty of returns on their investment. They may also be able to reduce the impact of any future electricity price rises on their business costs as a result of generating their own electricity.

119. A proportion of the installations of small-scale generation will be carried out by small firms, thereby boosting job creation in this sector as the number of installations rises. These installations will also require maintenance and servicing which may have a positive impact on jobs.

120. An increase in the uptake of certain technologies, such as small wind, where the UK has a manufacturing base dominated by small firms, will create a particularly positive impact on job creation.

121. The impacts on small electricity suppliers have been borne in mind during the policy development process and we will be working with small suppliers on the detail of FITs to ensure they are not disproportionately impacted (see para 124).

122. Small firms who are not involved in either the supply or demand side of small-scale generation may see an increase in their electricity costs as a result of FITs.

Competition Assessment

123. The introduction of Feed-in Tariffs should significantly increase the scale and scope of the GB market for small-scale renewable energy technologies and ancillary products. UK manufacturing firms will benefit directly from this increase in demand and market growth should increase competition effects, encouraging innovation, driving prices down and enhancing the global competitiveness of UK firms.

124. The Feed-in Tariffs will be funded by a levy on electricity suppliers which is expected to result in higher retail electricity prices. This increase in input prices may impact on global competitiveness of UK firms. Administration of FITs payments could impact disproportionately on smaller electricity suppliers. However, the proposed cost levelisation mechanism, for both the cost of the tariffs and administrative costs, should

[35] http://www.nationalgrid.com/uk/Electricity/Operating+in+2020/

mitigate these effects (please see consultation document for further information). In addition, the consultation document proposes that suppliers with less than 50,000 domestic customers will be exempt from administering FITs.

Policy design and implementation

Guaranteed versus market export price

125. It is proposed that FITs generators will be offered a choice between receiving the guaranteed export price for excess generation (over and above what is used onsite) or selling excess generation on the market at a price negotiated by the generator.

126. In general, not guaranteeing an export price increases risk for generators and means that they would require a higher rate of return to invest. However, by offering the choice to generators we can allow “risk-seeking” generators (or those who wish to participate in the market for other reasons) to sell their excess generation independently without the need to increase tariffs and overall policy costs. The costs and benefits presented in this impact assessment are based on a fixed export price but are consistent also with offering a choice to generators.

On-site consumption

127. If there is a difference between the retail price that a FITs generator pays for imported electricity and the price that is received for exported electricity then there will be variation in benefits of the FITs between generators. Provided that the import price for electricity is greater than the export price, generators who consume a greater proportion of the generation onsite will benefit more. The on-site benefit will also differ depending on the retail price the generator pays for their import – the higher their import tariff the higher their reward. Furthermore, removing the risk of electricity price volatility through on-site use will have a value to some generators, particularly at the commercial scale. These impacts have not been quantified.

Transmission and distribution losses

128. Small-scale generation incentivised by FITs will be, in almost all cases, closer to sources of electricity demand than the large sources of generation that it will displace. This will reduce transmission and distribution losses which occur when electricity is transmitted from power stations to centres of demand. The extent to which this has an impact will depend on where FITs installations are located relative to sources of demand and grid infrastructure.

Engagement

129. An important benefit of small-scale installations incentivised by the FITs will be increased public engagement with renewable energy generation and behavioural change with regard to energy use. This benefit has not been quantified.

Metering Costs

130. It is proposed that meters will be required to log generation from installations in order to calculate the level of FITs payments. The metering required will vary depending on the size of installation, destination of electricity generated (i.e. on-site use versus pure export) and the availability of smart meters. There will be costs associated with the purchase, installation and reading of the meters. Capital costs of export meters have been incorporated within the reduction of the assumed value of exports from wholesale price (approx 6p/kWh) to 3p/kWh. Generators will incur marginal costs of installing generation meters (in comparison to overall technology installation costs).

Accreditation

131. An accreditation requirement for participation in FITs, (such as the microgeneration certification scheme (MCS)[36] which is for a requirement for participation in the Low Carbon Buildings Programme grant scheme) for product manufacturers should improve product reliability but may also have anti-competitive effects which may raise the cost of delivering small-scale renewable electricity generation.

132. Enforced accreditation is likely to lead to enhanced product reliability and may bring health and safety benefits over and above existing standards. However, such a system would impose costs on potential new entrants to the UK market for small-scale electricity generation capital goods. This barrier to entry may also shelter incumbent (already accredited) firms from competition and allow them to gain from high prices for their products as demand increases with the introduction of FITs. Higher prices resulting from high levels of concentration in manufacturing and supply chain industries could constrain demand and raise the level of support required for any given level of generation. These impacts have not been quantified.

Grid Connection

133. A connection to the grid will be required for FITs generators that wish to export electricity. The cost of connection will vary depending on the site location and capacity of the installation. Further analysis is required to quantify these costs.

[36] http://www.microgenerationcertification.org/

Specific Impact Tests: Checklist

Use the table below to demonstrate how broadly you have considered the potential impacts of your policy options.

Ensure that the results of any tests that impact on the cost-benefit analysis are contained within the main evidence base; other results may be annexed.

Type of testing undertaken	***Results in Evidence Base?***	***Results annexed?***
Competition Assessment	Yes	No
Small Firms Impact Test	Yes	No
Legal Aid	No	No
Sustainable Development	No	No
Carbon Assessment	Yes	No
Other Environment	Yes	No
Health Impact Assessment	No	No
Race Equality	No	No
Disability Equality	No	No
Gender Equality	No	No
Human Rights	No	No
Rural Proofing	No	No

Annex A – FITs Tariff Levels

Table 1 – Option 1 (Core changes to consultation lead)

Technology	Size	Initial feed-in tariff level (£/MWh)	Degression rate (% per year)
PV	New build domestic (2kW)	345	7%
PV	Retrofit domestic (2kW)	395	7%
PV	New build 4-10kW	345	7%
PV	Retrofit 4-10kW	345	7%
PV	New build 10–100kW	300	7%
PV	Retrofit 10–100kW	300	7%
PV	New build 100–5000kW	280	7%
PV	Retrofit 100–5000kW	280	7%
PV	Stand alone system	280	7%
Wind	B-M <1.5kW urban	330	4%
Wind	B-M <1.5kW rural	330	4%
Wind	M-M urban	330	4%
Wind	M-M rural	330	4%
Wind	1.5–15kW urban	255	3%
Wind	1.5–15kW rural	255	3%
Wind	15–50kW urban	230	3%
Wind	15–50kW rural	230	3%
Wind	50–250kW	200	0%
Wind	250–500kW	180	0%
Wind	500–3000kW	45	0%
Hydro	1–10kW	190	0%
Hydro	10–50kW	145	0%
Hydro	50–100kW	145	0%
Hydro	100–500kW	105	0%
Hydro	500–1,000kW	105	0%
Hydro	1,000–5,000kW	45	0%
Waste	AD	90	0%

Table 2 – Option 2 (Further refinements to consultation lead = chosen option)

Final tariff table (in 2010 prices)

Technology	Scale	Tariff level for new installations in period (p/kWh) [NB tariffs will be inflated annually]			Tariff lifetime (years)
		Year 1: 1/4/10 – 31/3/11	Year 2: 1/4/11 – 31/3/12	Year 3: 1/4/12 – 31/3/13	
Anaerobic digestion	≤500kW	11.5	11.5	11.5	20
Anaerobic digestion	>500kW	9.0	9.0	9.0	20
Hydro	≤15 kW	19.9	19.9	19.9	20
Hydro	>15-100 kW	17.8	17.8	17.8	20
Hydro	>100 kW-2 MW	11.0	11.0	11.0	20
Hydro	>2 MW – 5 MW	4.5	4.5	4.5	20
MicroCHP pilot*	<2 kW*	10*	10*	10*	10*
PV	≤4 kW (new build)	36.1	36.1	33.0	25
PV	≤4 kW (retrofit)	41.3	41.3	37.8	25
PV	>4-10 kW	36.1	36.1	33.0	25
PV	>10-100 kW	31.4	31.4	28.7	25
PV	>100kW-5MW	29.3	29.3	26.8	25
PV	Stand alone system	29.3	29.3	26.8	25
Wind	≤1.5kW	34.5	34.5	32.6	20
Wind	>1.5-15kW	26.7	26.7	25.5	20
Wind	>15-100kW	24.1	24.1	23.0	20
Wind	>100-500kW	18.8	18.8	18.8	20
Wind	>500kW-1.5MW	9.4	9.4	9.4	20
Wind	>1.5MW-5MW	4.5	4.5	4.5	20
Existing microgenerators transferred from the RO		9.0	9.0	9.0	[to 2027]

*Support for micro CHP will be reviewed at the 12,000th installation.

Table 3 – Option 3 (8% ROI)

PV (850kWh/kWp/yr)	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
New build domestic (2kW)	£517	£480	£447	£417	£390	£365	£353	£342	£331	£321	£312
Retrofit domestic (2kW)	£590	£549	£512	£478	£447	£419	£406	£393	£381	£370	£359
New build 4-10kW	£507	£461	£420	£382	£348	£316	£302	£288	£275	£263	£251
Retrofit 4-10kW	£507	£461	£420	£382	£348	£316	£302	£288	£275	£263	£251
New build 10–100kW	£454	£413	£376	£342	£312	£284	£271	£259	£247	£236	£225
Retrofit 10–100kW	£454	£413	£376	£342	£312	£284	£271	£259	£247	£236	£225
New build 100–5000kW	£423	£385	£350	£319	£290	£264	£252	£240	£230	£219	£209
Retrofit 100–5000kW	£423	£385	£350	£319	£290	£264	£252	£240	£230	£219	£209
Stand alone system	£423	£385	£350	£319	£290	£264	£252	£240	£230	£219	£209

Wind (select windspeed)	3 - 6.5 m/s										
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
B-M <1.5kW urban	£4,930	£4,584	£4,265	£3,973	£3,704	£3,456	£3,411	£3,367	£3,323	£3,281	£3,238
B-M <1.5kW rural	£1,000	£932	£870	£813	£760	£711	£702	£694	£685	£677	£669
M-M urban	£4,000	£3,729	£3,480	£3,250	£3,039	£2,845	£2,810	£2,775	£2,741	£2,707	£2,674
M-M rural	£595	£555	£519	£486	£455	£427	£422	£417	£412	£407	£402
1.5–15kW urban	£642	£618	£595	£574	£555	£537	£535	£533	£530	£528	£525
1.5–15kW rural	£237	£228	£219	£212	£204	£198	£197	£196	£195	£194	£194
15–50kW urban	£598	£578	£559	£540	£522	£505	£495	£485	£475	£465	£455
15–50kW rural	£220	£213	£206	£199	£192	£186	£182	£179	£175	£171	£168
50–100kW	£220	£213	£206	£199	£192	£186	£182	£179	£175	£171	£168
100–500kW	£151	£146	£141	£137	£132	£128	£125	£123	£120	£117	£115
500–1500kW	£115	£113	£110	£108	£106	£104	£102	£101	£100	£98	£97
1500-5000kW	£93	£93	£92	£91	£91	£91	£90	£90	£90	£89	£89

Hydro	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
1-15kW	£240	£240	£240	£240	£240	£240	£240	£240	£240	£240	£240
15-50kW	£228	£228	£228	£228	£228	£228	£228	£228	£228	£228	£228
50–100kW	£218	£218	£218	£218	£218	£218	£218	£218	£218	£218	£218

100–1000kW	£139	£139	£139	£139	£139	£139	£139	£139	£139	£139	£139
1000-2000kW	£119	£119	£119	£119	£119	£119	£119	£119	£119	£119	£119
2,000–5,000kW	£93	£93	£93	£93	£93	£93	£93	£93	£93	£93	£93

Waste											
AD -food waste > 500kW	£90	£90	£90	£90	£90	£90	£90	£90	£90	£90	£90
AD farm-scale	126	126	126	126	126	126	126	126	126	126	126