Summary: Intervention & Options URN: 09D/703

Department /Agency:	Title:	
DECC	Impact Assessment of Feed-in Tariffs for Small-Scale, Low Carbon, Electricity Generation	
Stage: Consultation	**Version: 1.0**	**Date: 15 July 2009**
Related Publications: Consultation on Renewable Financial Incentives; Renewable Energy Strategy.		

Available to view or download at:

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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?

To 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 renewable electricity generation. The introduction of feed-in tariffs (FITs) will create a subsidy framework for small-scale low carbon technologies which is easily understood, offers more certain returns and covers a wide range of 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 have been considered, ranging from a ‘non-microgen’ (50kW to 5MW) approach to a ‘rate of return’ approach. Scenarios presented in this IA were identified based on: cost-effectiveness; contribution to 2020 renewable energy target; engagement at the household level; and compatibility with broader energy policy. The lead scenario has been chosen to strike a balance between the objectives outlined above and the relative expense/ease of deployment of the various technologies.

The scenarios outlined in this IA are indicative and there is flexibility in the policy design to allow for adjustments to be made as evidence on actual deployment emerges. It should also be noted that whilst this option represents our preferred approach to tariff-setting, the tariff design and actual tariff levels themselves may change as we work to refine the tariffs (including following feed-back to the consultation).

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

Ministerial Sign-off For consultation 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:

Summary: Analysis & Evidence

Policy Option: Lead scenario	Description: Tariffs supporting both small (<50kW) and large scale (50kW–5MW) installations

COSTS

ANNUAL COSTS		
One-off (Transition)	Yrs	
£		
Average Annual Cost (excluding one-off)		
£ 610m		

Description and scale of **key monetised costs** by 'main affected groups' The estimated resource cost is £600m in 2020, **£8.7bn** cumulative to 2030 (net of the £780m value of carbon saved).

The estimated cost to consumers, cumulative to 2030, is £7.9bn. This leads to an average increase in annual household electricity bills of approximately £10 over the period 2011-2030.

Total Cost (PV) **£ 8.7bn**

Other **key non-monetised costs** by 'main affected groups' Costs not included:- policy implementation i.e. administrative costs; compliance costs for electricity suppliers; costs of grid connection; costs of intermittency and grid balancing; indirect costs to the economy of increased energy prices. These costs could be significant.

BENEFITS

ANNUAL BENEFITS		
One-off	Yrs	
£		
Average Annual Benefit (excluding one-off)		
£ N/A		

Description and scale of **key monetised benefits** by 'main affected groups' **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 **£780m** (and is netted off total costs above).

Total Benefit (PV) **£ N/A**

Other **key non-monetised benefits** by 'main affected groups' Additional benefits include consumer engagement (including greater energy awareness potentially leading to demand reduction), 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; avoidance of / 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 Impacts presented in this IA reflect old carbon price assumptions. Under revised carbon prices, the value of carbon saved cumulative to 2030 is £830m giving a net benefit of **- £8.7bn** (to nearest £0.1bn).

Price Base Year 2008	Time Period Years 20	**Net Benefit Range** (NPV)	**NET BENEFIT** (NPV Best estimate) **£ - 8.7bn**

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?			£ unknown	
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?			£ 780m (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 £	Decrease £	**Net Impact**	**£**

Key: Annual costs and benefits: Constant (Net)

Summary: Analysis & Evidence

Policy Option: 8% ROI scenario	Description: Tariffs giving an 8% Return on Investment across all installations

COSTS

ANNUAL COSTS		Description and scale of **key monetised costs** by 'main affected groups' The estimated resource cost is £1.5bn in 2020, **£19.9bn** cumulative to 2030 (net of the £1bn value of carbon saved).
One-off (Transition)	Yrs	
£		
£ 1.4bn		**Total Cost** (PV) **£ 19.9bn**

Other **key non-monetised costs** by 'main affected groups' Costs not included:- policy implementation i.e. administrative costs; compliance costs for electricity suppliers; costs of grid connection; costs of intermittency and grid balancing; indirect costs to the economy of increased energy prices. These costs could be significant.

BENEFITS

ANNUAL BENEFITS		Description and scale of **key monetised benefits** by 'main affected groups' **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 **£1bn** (and is netted off total costs above).
One-off	Yrs	
£		
Average Annual Benefit (excluding one-off)		
£ N/A		**Total Benefit** (PV) **£ N/A**

Other **key non-monetised benefits** by 'main affected groups' Additional benefits include consumer engagement (including greater energy awareness potentially leading to demand reduction), 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; avoidance of / 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 Impacts presented in this IA reflect old carbon price assumptions. Under revised carbon prices, the value of carbon saved cumulative to 2030 is £1.1bn giving a net benefit of - **£19.8bn**.

Price Base Year 2008	Time Period Years 20	**Net Benefit Range** (NPV)	**NET BENEFIT** (NPV Best estimate) **£ - 19.9bn**

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?			£ unknown	
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?			£ 1bn (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	£	Decrease	£	**Net Impact**	£

Key: Annual costs and benefits: Constant (Net)

Summary: Analysis & Evidence

Policy Option: Community scenario	**Description: Tariffs supporting both small (<50kW) and large scale (50kW-5MW) installations**

COSTS

ANNUAL COSTS		Description and scale of **key monetised costs** by 'main affected groups' The estimated resource cost is £550m in 2020, **£8.2bn** cumulative to 2030 (net of the £780m value of carbon saved).
One-off (Transition)	**Yrs**	
£		
Average Annual Cost (excluding one-off)		
£ 580m		**Total Cost** (PV) **£ 8.2bn**

Other **key non-monetised costs** by 'main affected groups' Costs not included:- policy implementation i.e. administrative costs; compliance costs for electricity suppliers; costs of grid connection; costs of intermittency and grid balancing; indirect costs to the economy of increased energy prices. These costs could be significant.

BENEFITS

ANNUAL BENEFITS		Description and scale of **key monetised benefits** by 'main affected groups' **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 **£780m** (and is netted off total costs above).
One-off	**Yrs**	
£		
Average Annual Benefit (excluding one-off)		
£ N/A		**Total Benefit** (PV) **£ N/A**

Other **key non-monetised benefits** by 'main affected groups' Additional benefits include consumer engagement (including greater energy awareness potentially leading to demand reduction), 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; avoidance of / 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 Impacts presented in this IA reflect old carbon price assumptions. Under revised carbon prices, the value of carbon saved cumulative to 2030 is £820m giving a net benefit of **- £8.1bn**.

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?			£ unknown	
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?			£ 780m (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 £	Decrease £	**Net Impact** £	

Key: Annual costs and benefits: Constant (Net)

Summary: Analysis & Evidence

Policy Option: Non-microgen scenario	**Description: Tariffs only supporting installations between 50kW and 5MW**

COSTS

ANNUAL COSTS		Description and scale of **key monetised costs** by 'main affected groups'	
One-off (Transition)	**Yrs**	The estimated resource cost is £150m in 2020, **£2.1bn** cumulative to 2030 (net of the £700m value of carbon saved).	
£			
Average Annual Cost (excluding one-off)			
£ 150m		**Total Cost** (PV)	**£ 2.1bn**

Other **key non-monetised costs** by 'main affected groups' Costs not included:- policy implementation i.e. administrative costs; compliance costs for electricity suppliers; costs of grid connection; costs of intermittency and grid balancing; indirect costs to the economy of increased energy prices. These costs could be significant.

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 **£700m** (and is netted off total costs above).	
£			
Average Annual Benefit (excluding one-off)			
£ N/A		**Total Benefit** (PV)	**£ N/A**

Other **key non-monetised benefits** by 'main affected groups' Additional benefits include consumer engagement (including greater energy awareness potentially leading to demand reduction), 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; avoidance of / 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 All costs presented in this IA reflect old carbon price assumptions. Under revised carbon prices, the value of carbon saved is £750m giving a net benefit of **- £2.1bn** (to nearest £0.1bn).

Price Base Year 2008	Time Period Years 20	**Net Benefit Range** (NPV)	**NET BENEFIT** (NPV Best estimate) **£ - 2.1bn**

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?			£ unknown	
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?			£ 700m (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	£	Decrease	£	**Net Impact**	**£**

Key: **Annual costs and benefits: Constant** **(Net)**

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 behaviour change and reduced distribution and transmission losses.

3. Feed-in tariffs are a per unit subsidy payment (p/kWh) for sub-5MW renewable electricity generation and sub-50kW non-renewable CHP generation. The proposed design will be easily understood and offer more certain returns, so as to be accessible to a wide range of individuals and organisations alongside energy professionals. The FITs will be funded by a levy paid by electricity suppliers which will 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 consultation impact assessment (IA) presents analysis on the possible costs and benefits of implementing FITs. It builds on the initial FITs IA published alongside the Renewable Energy Strategy (RES). Further work will continue on refining the level and design of the tariffs following responses to the Renewable Financial Incentives Consultation which this IA accompanies.

B. Objectives

6. The objective of FITs is to contribute to the UK's 2020 renewable energy target through greater take-up of 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. Greater deployment of small-scale technologies will allow supply chains and economies of scale on production costs to develop such that the costs of installing the technologies will fall and they should become more competitive.

7. Under a business-as-usual / do-nothing scenario, generation from sub-5MW renewable installations is expected to account for approximately 0.6% of total electricity demand in 2020. FITs are expected to be effective in significantly increasing this level of renewable uptake through addressing the main barrier currently preventing investment at the sub-5MW level i.e. high technology costs.

8. Our analysis considers four tariff-setting scenarios which are projected to deliver approximately 2% (or 8TWh) of final UK electricity consumption in 2020.

9. These scenarios are not the only scenarios possible, but have been chosen to illustrate key findings including the trade-off between overall policy costs and the policy objectives outlined above.

10. This IA sets out analysis on the potential costs and benefits of various approaches to setting tariffs, including (qualitative) assessment of policy design issues.

C. Costs and benefits of implementing FITs

(i) Do-nothing / Business-as-usual

11. Under business-as-usual, the current Renewables Obligation (RO) subsidy framework is projected to incentivise approx 2TWh of sub-5MW renewable electricity generation[1] 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

12. Since last year's RES consultation the Government has undertaken significant analysis in order to better understand the barriers to uptake of small-scale low carbon electricity generation (e.g. financial barriers and supply and demand side barriers).

13. The results presented in this IA are based on analysis using a model built by independent consultants, Element Energy/Poyry Consulting[2]. Their study looks into the costs and potential uptake for a range of

[1] Not including landfill or sewage gas.
[2] Design of Feed-in Tariffs for sub-5MW Electricity in Great Britain - Quantitative Analysis; Qualitative Issues in the Design of the GB Feed-in Tariffs.

technologies including wind, solar PV, hydro, biomass, waste technologies, wave/tidal and non-renewable micro-chp[3].

The model

14. 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"[4], which in turn is determined by a range of factors including cost of capital, preferences on payback periods, and alternative investment opportunities. 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 in order to invest. On the supply side, there are assumptions about maximum market growth rates and public acceptance of increasing levels of deployment for the various technologies which act to constrain uptake if FITs are very generous. In general, a higher subsidy level will see faster and higher levels of uptake.
15. The model covers a range of technologies (see para 13) which may be included in a Feed-in Tariffs system for Great Britain. These technologies vary in scale, ranging from household-level microgeneration (sub-50kW) 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 large projects such as biomass and wind turbines to relatively expensive 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, is estimated to have a technical potential of 60.4TWh/year, whereas sub-5MW hydroelectric installations are estimated to have a potential of only 4.7TWh/year since potential is constrained by the availability of suitable water flow. Further information on technical potentials can be found in the Element Energy/Poyry report accompanying the consultation document[5].
16. Within the model, investors have been divided into 4 broad categories: householder, commercial (including public sector), developer and utility. These investors vary by the type of technology and scale at which they are willing and/or able to invest and also in 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.
17. The analysis controls for 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

[3] Landfill and sewage gas technologies have not been included as they are considered to be adequately supported under the RO.
[4] A hurdle rate reflects the minimum rate of return that a party will consider before taking up an investment opportunity.
[5] Design of Feed-in Tariffs for sub-5MW Electricity in Great Britain - Quantitative Analysis.

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 over time and to drive innovation and cost reduction; and the option of setting a *fixed financial rate of return* across all technologies and scales.

18. In addition, we are able to analyse both “fixed” and “premium” FITs structures. Under a system of “premium” tariffs, the investor receives a per-unit (p/kWh) subsidy for all the electricity generated and also retains ownership of the electricity which can be used either for consumption onsite or can be sold on the market. Under a system of “fixed” tariffs, investors receive a per unit subsidy for electricity generated but do not retain title for the electricity. In the context of the model, “fixed” tariffs are assumed to be less risky to investors (as they do not have to face variations in electricity prices nor face the hassle of selling excess electricity on the market). Therefore investors are modelled as having a hurdle rate that is 1% lower than under “premium” tariffs across all technologies and scales. This means that an equivalent level of uptake will require higher overall remuneration (with higher associated costs) under a system of “premium” tariffs compared to a system of “fixed” tariffs.

19. 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 generation. 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 2TWh of sub-5MW renewable electricity is anticipated per year by 2020. This capacity will mainly be concentrated in the large wind sector.

20. 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. However, the policy will be designed to be flexible (e.g. with regular tariff reviews) so that it can adapt over time as more information becomes available.

<u>Scenarios modelled</u>

21. Four main scenarios are covered in this impact assessment, all of which deliver roughly 2% of final electricity consumption in 2020 (i.e. approx 8TWh in total, approx 6TWh additional to the baseline) through sub-5MW renewable technologies. The scenarios modelled are as follows:

- “8% ROI”
- “lead scenario”
- “community”
- “non-microgen”

“8% ROI” scenario

22. 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)[6]. 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[7]. In contrast, far fewer large installations are seen under this scenario since an 8% ROI is assumed to be an insufficient incentive for utilities and developers. 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. As PV is a relatively high-cost (£/MWh) technology, overall costs (both resource costs and costs to consumers) are significantly higher when compared to the other scenarios. 2,800,000 renewable installations are projected to be installed by 2020, generating 8TWh of additional (to the baseline) electricity in 2020 at a resource cost of £1.5bn in 2020 (annual), £19.9bn cumulative to 2030.

“non-microgen” scenario

23. The “non-microgen” scenario brings on very little microgeneration (i.e. sub-50kW generation). It has the lowest resource cost out of all the scenarios modelled and incentivises a relatively small number of large installations (e.g. 2-5MW). Under this scenario a tariff of £165/MWh is provided to the majority of installations (with the exception of waste-based technologies and large hydro[8]), which is projected to deliver a generation mix consisting mainly of low-cost technologies such as large wind, biomass CHP, hydro and waste. The non-microgen scenario delivers 8,600 renewable installations by 2020, generating 6TWh of additional (to the baseline) electricity in 2020 at a resource cost of £150m in 2020 (annual), £2.1bn cumulative to 2030.
24. This scenario delivers negligible installations at the household level since the relatively low tariff levels are not sufficient to cover the costs of generation at this scale. As a result, the generation mix is not as diverse as under the other scenarios and there would be less engagement at the household/community level.

“community” scenario

[6] Please see Annex A for the tariff schedule used in this scenario.
[7] Such investors include ‘early adopters’. For further information on investor behaviour please refer to the Element Energy/Poyry reports.
[8] Please see Annex A for tariff schedule used in this scenario.

25. The “community” scenario involves making adjustments to the tariff levels under the “non-microgen” scenario to try to achieve increased deployment at the household and community scale as well as bring on generation at the larger scale. This scenario aims to strike a balance between achieving public engagement whilst containing overall policy costs. Relative to the “non-microgen” scenario, the “community” scenario offers higher tariffs to more expensive (£/MWh) small scale installations such as solar PV and small wind and lower tariffs for larger installations. This has the effect of introducing significant numbers of these smaller technologies into the generation mix. This scenario is projected to deliver 660,000 renewable installations by 2020, generating 6TWh of additional (to the baseline) electricity in 2020 at a resource cost of £550m in 2020 (annual), £8.2bn cumulative to 2030.

lead scenario

26. As with the “community” scenario, the lead scenario aims to encourage a mixture of small and large scale installations, but takes a more methodical approach to tariff-setting. The approach taken uses the “8% ROI” scenario as a starting point, with adjustments then being made to ease administration of the tariffs, reflect technology-specific risk and ease of deployment, and to ensure consistency with existing support mechanisms (the RO). Whereas the previous scenarios assessed fixed tariffs, modelling for the lead scenario is based upon a premium tariff to reflect policy decisions relating to the functioning of the electricity market for small-scale generation (please see consultation document for further information).

27. The key difference between tariff levels in the lead and “8% ROI” scenarios is that PV tariffs have been reduced to reflect the fact that PV is easier to deploy than other technologies (e.g. it has permitted development at the domestic scale[9]) and carries less risk for the investor given that it is a tried and tested technology. Tariffs for biomass, anaerobic digestion, wave, tidal, large scale wind and hydro have been brought into line with banded RO support levels in order to avoid distortions between the two support regimes. Although investors will receive an equivalent financial return for these technologies as they would under the RO, they will benefit from the increased certainty of Feed-in Tariff payments vis-à-vis the market-based RO. In addition, the 8% rate of return for wind turbines has been calibrated against a site with an average wind speed of 5.5m/s (as opposed to 6.5m/s in the “8% ROI” scenario) to compensate for the switch from fixed to premium FITs and the higher level of risk and associated hurdle rates that this entails. Finally, adjustments are made to the tariffs to reflect the fact that under “premium” tariffs, investors retain the rights to the electricity produced and therefore benefit from onsite use and from selling excess electricity on the market (this is not the case for “fixed” tariffs where the generator does not retain the rights to the electricity produced). The price at which investors may sell any excess electricity to the market is modelled as 5p/kWh (please refer to consultation document for further information).

28. The scenario is projected to deliver 870,000 renewable installations by 2020, generating approximately 6TWh of additional (to the baseline)

[9] This means that domestic PV installations do not require planning consent.

electricity in 2020 at a resource cost of £600m in 2020 (annual), £8.7bn cumulative to 2030.

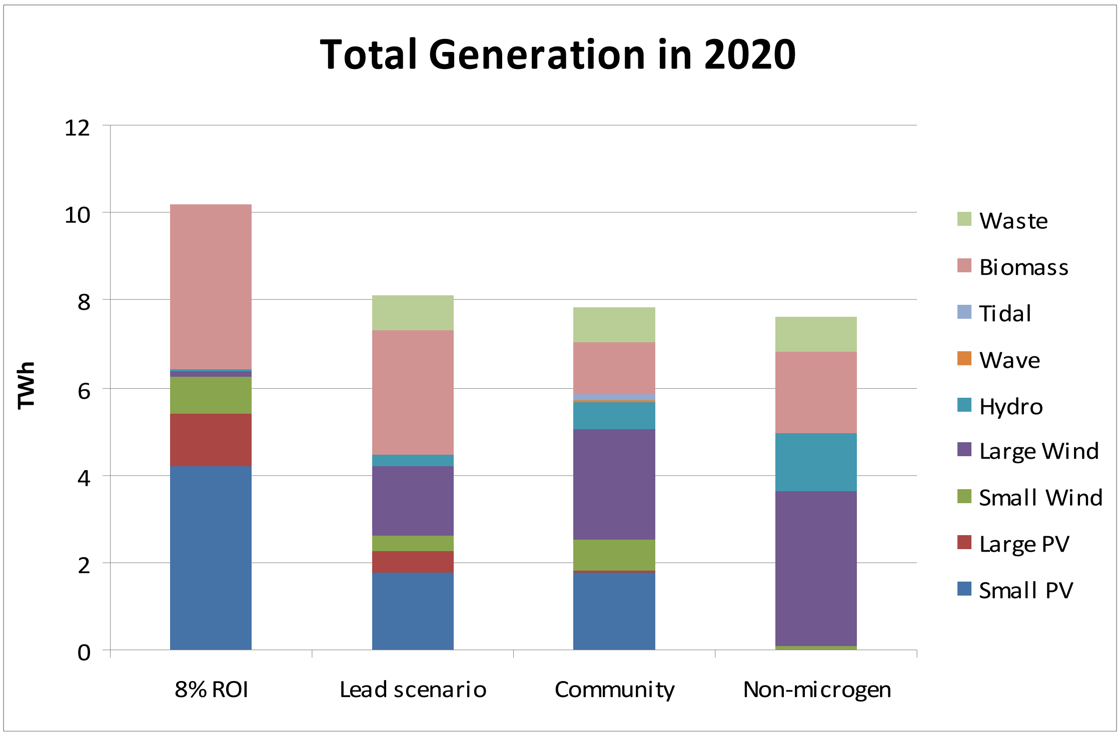
Recommended scenario

29. The lead scenario has been chosen as the recommended scenario as it achieves the best overall balance between delivering policy objectives, including engaging households and communities in the climate change and renewable energy agenda, whilst limiting overall costs of the policy. 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. The tariff-setting approach used is also more transparent than the "community" scenario whilst bringing on a significantly larger number of domestic scale installations for a similar cost (see para 31). The scenario is also used as the lead scenario for analysis carried out for the Renewable Energy Strategy.

Results

Key costs and benefits

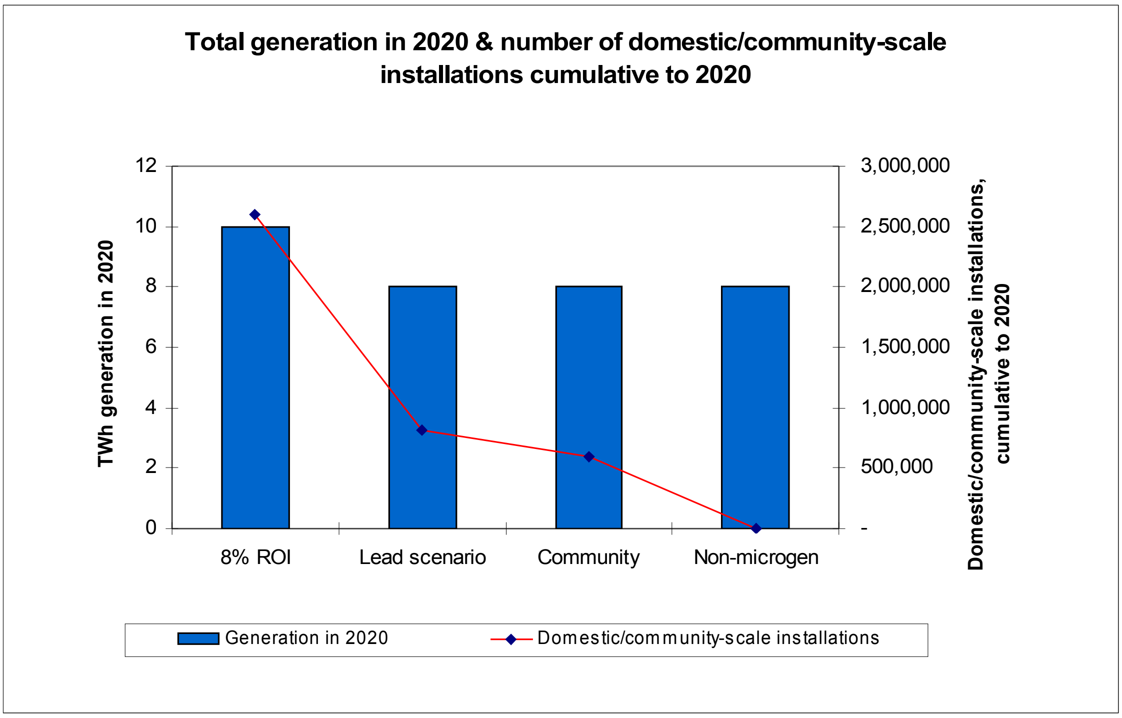
Figure 1 – Technology mix under different scenarios



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

30. Figure 1 illustrates the generation mix that is delivered under the four modelled scenarios. "8% ROI" delivers generation only at the domestic/community scale, whilst "non-microgen" delivers only larger scale technologies such as large wind. The remaining two scenarios achieve a more diverse balance of technologies, an objective of FITs policy.

Figure 2 – Generation levels in 2020 and domestic/community-scale installations by 2020



* Generation and installation numbers are presented as inclusive of baseline.

* Figures have been rounded.

* Numbers of domestic/community-scale installations are approximations, based on projected domestic PV, micro-wind and small wind (1.5kW-50kW) installations.

31. Figure 2 illustrates total projected renewable generation by 2020 and highlights the difference in numbers of domestic/community-scale installations incentivised under each scenario despite the similar generation levels. Tariff levels under "non-microgen" are insufficient to cover the generation costs of smaller scale technologies (such as solar PV and small wind) and so fail to deliver significant domestic scale installations. "8% ROI" offers a more generous schedule of tariffs for domestic scale installations, bringing on a significant number of installations at this size, but very few larger scale installations since utilities and developers require a higher than 8% return in order to invest. The remaining two scenarios lead to a mixture of smaller and larger scale technologies. The lead scenario brings on over 200,000 more domestic/community-scale installations compared to "community" for a similar cost (see Table 1 for cost information).

32. Table 1 below shows that costs vary significantly depending on the mix of technologies/scales incentivised by FITs and the number of individual installations incentivised.

33. Of the scenarios presented in this impact assessment, “non-microgen” has the lowest resource cost and by far the lowest number of installations, consisting mainly of large-scale, relatively low-cost (£/MWh) technologies such as large wind. This scenario delivers 8,600 renewable installations at a £30/MWh resource cost[10] in 2020, costing £2.1bn cumulative to 2030. In comparison, the “8% ROI” scenario has the highest resource cost and delivers the highest number of installations which consist mainly of small-scale relatively high-cost (£/MWh) technologies e.g. solar PV. This policy option delivers 2,800,000 renewable installations at a £190/MWh resource cost in 2020, costing £19.9bn cumulative to 2030.

34. In between these two extremes lie the “community” and lead scenarios which have been designed to deliver a more balanced mixture of small and large scale installations, and low and higher cost technologies, in comparison to the other options modelled. As a result their costs lie in between those of the “non-microgen” and “8% ROI” scenarios. The lead scenario delivers 870,000 installations at a £100/MWh resource cost in 2020, costing £8.7bn cumulative to 2030. The “community” scenario delivers 660,000 installations at a £100/MWh resource cost in 2020, costing £8.2bn cumulative to 2030.

35. The carbon abatement benefits achieved under the four scenarios are very similar as shown in Table 1 since they all incentivise broadly the same level of additional (to baseline) renewable generation in 2020, around 6TWh (8TWh for “8% ROI”), generating carbon savings valued at between £700m (“non-microgen”) and £1bn (“8% ROI”) cumulative to 2030. Carbon benefits are valued at the traded price of carbon[11] since renewable generation under FITs is expected to displace grid generation (which is covered by the EU ETS).

36. Other, less tangible, benefits are more difficult to quantify. In terms of “public engagement” benefits, “8% ROI” delivers the greatest number of installations at the household and community level and therefore is likely to have the greatest impact, but at a higher cost. The lead and “community” scenarios also deliver significant numbers of installations at the household/community scale. In contrast, “non-microgen” delivers a technology and investor mix that is very similar to the baseline, so would be unlikely to deliver additional “engagement” benefits. Out of the options presented, the lead and “community” scenarios deliver the broadest range of technologies and therefore should be the most effective in driving innovation and bringing costs down. The “non-microgen” and “8% ROI” scenarios deliver a more narrow range of technologies, so are likely to be less effective in achieving this policy objective.

Table 1 – Summary of costs and benefits

[10] Resource costs in this impact assessment are presented as net of the value of CO_2 abated.
[11] Please see supporting analytical annex to the RES for traded carbon price assumptions.

	8% ROI	Lead scenario	Community	Non-microgen
Annual resource cost in 2020	£1.5bn	£600m	£550m	£150m
Resource cost in 2020	£190/MWh	£100/MWh	£100/MWh	£30/MWh
Cumulative resource cost to 2020	£7.6bn	£3.8bn	£3.7bn	£920m
Cumulative resource cost to 2030	**£19.9bn**	**£8.7bn**	**£8.2bn**	**£2.1bn**
Annual cost to consumers in 2020	£1.3bn	£560m	£530m	£340m
Cumulative cost to consumers to 2020	£6.7bn	£3.2bn	£3.2bn	£1.6bn
Cumulative cost to consumers to 2030	**£17.6bn**	**£7.9bn**	**£7.6bn**	**£4.5bn**
Additional electricity generation in 2020	8TWh	6TWh	6TWh	6TWh
Total electricity generation in 2020	**10TWh**	**8TWh**	**8TWh**	**8TWh**
Cumulative tonnes CO2 saved to 2020	11m	10m	11m	9m
Cumulative CO2 savings to 2020	£270m	£240m	£260m	£210m
Cumulative CO2 savings to 2030	**£1bn**	**£780m**	**£780m**	**£700m**
Policy Net Present Value 2020	-£7.6bn	- £3.8bn	- £3.7bn	- £920m
Policy Net Present Value 2030	**-£19.9bn**	**-£8.7bn**	**- £8.2bn**	**- £2.1bn**

* 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.

* Resource costs are net of the value of carbon abated.

* Figures have been rounded.

Consumer costs

37. Policy costs in this IA are presented both in terms of *resource costs* and in terms of *costs to consumers*[12]. 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 / 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.

38. 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[13] 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

[12] The terms 'cost to consumers' and 'subsidy cost' are used interchangeably in this IA.

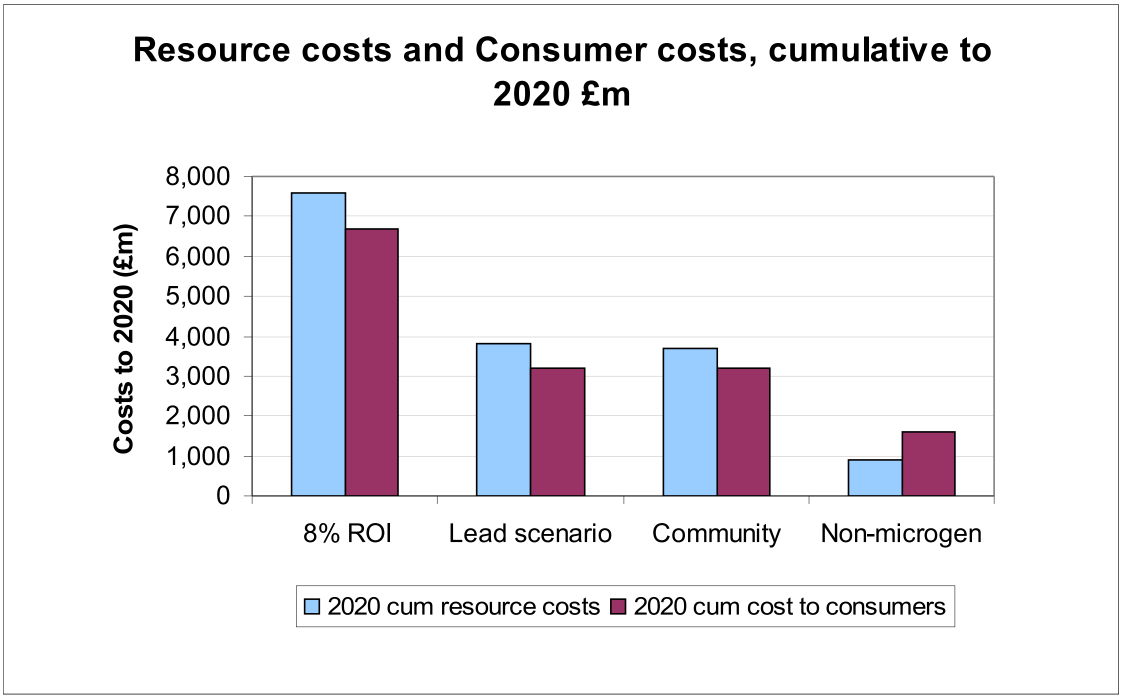
[13] A hurdle rate reflects the minimum rate of return that an investor will consider before taking up an investment opportunity.

the likely distribution of hurdle rates across investor types, and uses this information to set the tariffs required for different levels of renewable deployment.

39. 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.

40. Figure 3 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[14].

Figure 3 – Cumulative costs to 2020



41. Under the “8% ROI”, lead and “community” scenarios, subsidy costs are lower than resource costs. This may appear counter-intuitive at first, but can be explained by the fact that these scenarios incentivise a greater level of deployment at the domestic-sector level (e.g. domestic PV) compared with the “non-microgen” scenario, 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. In contrast, subsidy costs under “non-microgen” are

[14] 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.

higher than resource costs, largely due to the high proportion of large wind in the generation mix. Investors who deploy turbines in optimum (i.e. high wind-speed) sites earn 'excess profit' (because the tariff payments they receive under this scenario are higher than is actually required for them to undertake the investment).

Impact on bills

42. Implementing a subsidy framework for small-scale low carbon electricity generation via a FITs policy will incur resource costs to the economy (£3.8bn cumulative to 2020 under the lead scenario). Subsidy costs (i.e. the costs to consumers identified in Table 1 above) will also be incurred (£3.2bn cumulative to 2020 under the lead scenario). End 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 lead scenario would lead to an average increase in annual household electricity bills of approximately £10 (2%) for the period 2011-2030. Average annual industrial bills are projected to rise by around 2% over the same period.

Table 2 – Impact on electricity bills,

Domestic bills

	Average bill impact	% impact
2015	£6	1%
2020	£13	3%
2011-2030	£10	2%

Industrial bills

	% impact
2015	1%
2020	3%
2011-2030	2%

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

43. 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.

Installations

Table 3 – Cumulative installations to 2020 by investor type

	8% ROI	Lead scenario	Community	Non-microgen
Domestic	2,600,000	800,000	560,000	100
Commercial	190,000	55,000	85,000	1,500
Developer	0	1,000	1,000	1,500
Utility	0	2,000	7,000	500

* Installations shown here are additional to the baseline.

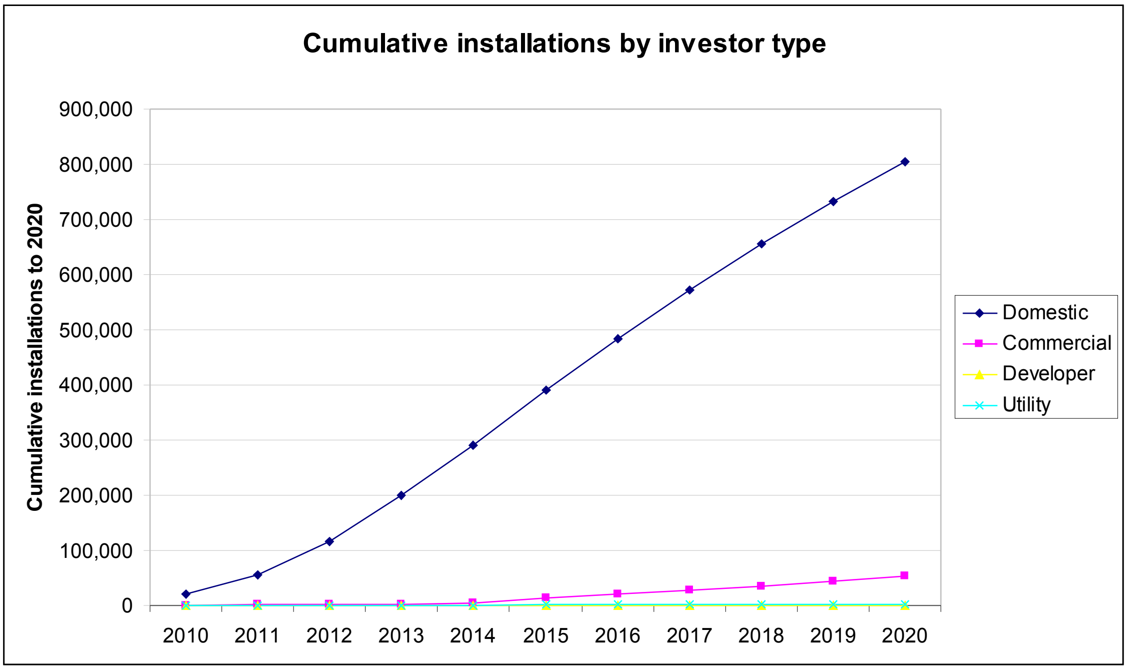
* Numbers have been rounded.

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

44. 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 "non-microgen" scenario incentivises a low number of relatively large installations. The "8% ROI", "community" and lead scenarios incentivise a relatively larger number of domestic-scale installations by 2020 since they focus on greater engagement with households/communities.

45. Figure 4 below illustrates the cumulative number of installations taken up by investor type over time for the lead scenario. Since this scenario has a focus on domestic 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 approximately 800,000 by 2020.

Figure 4 – Cumulative installations by investor type, lead scenario



* Installations shown here are additional to the baseline.

46. 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:-

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

47. 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[15].

48. Table 4 below indicates that carbon abatement under FITs is significantly more expensive than carbon abatement under the EU emissions trading scheme. The lead scenario reduces emissions with a cost-effectiveness of £269 against a weighted average discounted traded carbon price of £25. However, other objectives of the policy including community engagement are also important.

Table 4 – Climate change policy cost-effectiveness

	Carbon cost-effectiveness (£/ tCO_2)	WAD traded price of carbon
Lead scenario	£269	£25

Sensitivities

49. Since this is a new policy and because the 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 lead scenario.

Fossil fuel prices:-

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

51. Under the lower bound[16] fossil fuel price scenario, there is lower uptake in the baseline (i.e. no FITs) against which the policy is measured

[15] 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

[16] This reflects the "low energy demand" scenario – please see supporting analytical annex to the RES for further information.

because low electricity prices diminish the incentive to install relatively expensive renewable technologies in the absence of FITs. Additional resource costs are higher than under the central fossil fuel price scenario for two reasons. Firstly, resource costs increase because the difference between renewable and conventional generation costs increases under low fossil fuel prices. Secondly, since there is lower uptake in the baseline, the additional (to baseline) cost of meeting a given level of generation under FITs will be higher.

52. Under the upper bound[17] fossil fuel price scenario, there is greater deployment of renewable technologies in the baseline compared to under central fossil fuel prices and so the additional cost of reaching a given level of deployment under FITs reduces. In addition, under high fossil fuel prices, the cost differential between renewable and conventional generation decreases.

Table 5 – Fossil fuel sensitivities

	Fossil fuel price scenario	
Change relative to baseline	**Lower bound**	**Upper bound**
Annual resource cost in 2020	£860m	£190m
Resource cost in 2020	£130/MWh	£300/MWh
Cumulative resource cost to 2020	£5.0bn	£1.4bn
Cumulative resource cost to 2030	**£12.0bn**	**£2.9bn**
Annual cost to consumers in 2020	£650m	£140m
Cumulative cost to consumers to 2020	£3.8bn	£1.1bn
Cumulative cost to consumers to 2030	**£9.2bn**	**£2.2bn**
Additional electricity generation in 2020	7TWh	1TWh
Cumulative tonnes CO2 saved to 2020	12m	2m
Cumulative CO2 savings to 2020	£290m	£50m
Cumulative CO2 savings to 2030	£900m	£100m

Biomass prices:–

53. Central scenarios assume a low price of biomass. For the lead scenario we have modelled the impact of a higher biomass price[18] on generation costs. Table 6 shows that higher biomass prices lead to an increase in resource costs to the economy given that it is now more expensive to generate any given level of renewable electricity via biomass. Cost to consumers and the value of carbon saved remain unchanged since the tariff levels under the central biomass price scenario are still sufficient to incentivise the same level of biomass uptake[19].

[17] This reflects the "high demand, significant supply constraints" scenario – please see supporting analytical annex to the RES for further information.

[18] Assumptions on biomass prices are contained in the analytical annex to the RES.

[19] This suggests that under the central fossil fuel scenario, some investors in biomass installations were receiving higher tariff payments than required for them to invest so that when biomass prices increase, the tariff payments are still sufficient for them to invest.

Table 6 – High biomass price sensitivity

	High Biomass Price	Central Biomass Price
Resource cost (cum to 2020)	£3.9bn	£3.8bn
Resource cost (cum to 2030)	£9.3bn	£8.7bn

Discount rate:-

54. Central scenarios assume a discount rate of 10% (reflecting investors' cost of capital) when evaluating resource costs. For our lead scenario we have modelled the impact of assuming higher discount rates of 16% for the domestic sector and 12% for the non-domestic sectors[20] 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.

Table 7 – Discount rate sensitivity

	Sensitivity Discount Rates	Central Discount Rates
Resource cost (cum to 2020)	£5.6bn	£3.8bn
Resource cost (cum to 2030)	£13.0bn	£8.7bn

Carbon price:

55. Projections of the traded price of carbon used in the analysis are set out in the analytical annex to the RES[21]. Since these assumptions were agreed, carbon prices have been updated and published in the IAG[22]. We have carried out a sensitivity test for the lead scenario using the updated estimates and the results are set out in Table 8.

56. Relative to savings evaluated against previous carbon prices, carbon savings in the traded sector are valued lower towards 2010 but higher towards 2030[23]. Therefore carbon savings under the scenario are valued £70m lower cumulative to 2020 and £50m higher cumulative to 2030. Resource costs to the nearest £0.1bn remain unchanged.

Table 8 – Carbon price sensitivity

	Revised CO_2 Prices	Central CO_2 Prices

[20] 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 that accompanies the Renewable Energy Strategy.
[21] Please see supporting analytical annex to the RES for carbon price assumptions.
[22] Please see supporting analytical annex to the RES for carbon price assumptions.
[23] It should be noted that changes in the carbon price will also affect wholesale electricity prices. This in turn would affect the amount of uptake in the baseline and the level of uptake under any given (premium) tariff schedule. This additional impact has not been modelled here.

Resource cost (cum to 2020)	£3.8bn	£3.8bn
Resource cost (cum to 2030)	£8.7bn	£8.7bn
Carbon savings (cum to 2020)	£170m	£240m
Carbon savings (cum to 2030)	£830m	£780m

D. Implementation and Monitoring and Evaluation

57. 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.
58. Once the scheme has been implemented, we will conduct periodic tariff reviews, to coincide with reviews of the RO and RHI where possible[24]. These reviews will be conducted to evaluate the effectiveness of the existing tariff schedules and to consider the need for any changes to be made as more up-to-date information becomes available.

E. Other considerations

<u>Security of supply</u>

59. Intermittency: FITs will deliver a mixture of intermittent (non-controllable) and dispatchable (controllable) technologies onto the grid.
60. 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”[25].
61. Dispatchable technologies (e.g. biomass, waste) 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.
62. Generation mix: FITs have the potential to incentivise a diverse range of technologies and hence could increase generation diversity of the grid.
63. Fuel Imports: Increased renewables penetration in the electricity system will reduce our dependence on imported fossil fuels.
64. Grid resilience: A greater number of smaller electricity generating installations distributed around the country should increase the grid’s ability to withstand major interruptions.

<u>Air quality impacts of biomass CHP</u>

[24] The changes from the first periodic review will be implemented in 2013.
[25] http://www.nationalgrid.com/uk/Electricity/Operating+in+2020/

65. One of the technologies that will be supported by the FITs is solid fuel biomass CHP. FITs support is expected to encourage significant deployment of solid fuel biomass CHP in the commercial, industrial and (large) public sectors. Internal analysis indicates that intensive combustion of biomass can lead to significant adverse air quality impacts and associated health costs, dependent on the emission performance of the CHP plant, the geographic location and level of output. Of particular concern are emissions of PM (particulate matter), and Nitrogen oxides which are not subject to existing air quality regulations.

66. The potential for harm that could be caused by biomass emissions from CHP plants is to some extent mitigated by a number of controls in place which act to reduce the uptake of biomass in densely populated areas, including local policies and controls such as land use planning policy, declared Air Quality Management Areas (under the Environment Act 1995) and declared Smoke Control Areas (under the Clean Air Act 1993) and the Integrated Pollution Prevention and Control (IPPC) directive.

67. Table 9 summarises results of DEFRA analysis on the social costs of biomass combustion for our lead scenario.

68. We have not subtracted air quality costs from the Net Present Value calculations for the Feed-in Tariffs policy overall, as this calculation does not include the benefit from the (significant) heat output of biomass CHP.

Table 9 – Air quality impacts

	Final uptake level in 2020	**Annual social (health) cost in 2020**
Lead scenario	2.8 TWh (electricity) 9.2 TWh (heat)	£130m

Impact on small firms

69. 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.

70. 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.

71. 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.

72. 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 76).

73. 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

74. 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.

75. 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 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

Domestic micro-CHP

76. Domestic micro-CHP is a technology which is still not being commercially deployed at present; we expect commercial scale deployment to begin in late 2009/early 2010. As a result, we do not have sufficient cost and performance data to inform us on what tariff levels we should set.

77. In addition, micro-CHP is the only non-renewable technology which can be supported under FITs and it is installed primarily to meet the heat requirements of a premises[26].

78. Therefore, we have to consider how to set generation tariffs once we have more cost data and once our heat and energy efficiency policies (HESS and RHI) are more developed.

Guaranteed versus market export price

79. The consultation document proposes that FITs generators will be offered a one-off choice either to receive a guaranteed export price for excess

[26] The type of domestic micro-CHP that will be deployed in the next 1-2 years has a heat to electricity ratio of around 6:1.

generation (over and above what is used onsite) or to sell excess generation on the market at a price negotiated by the generator.

80. 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

81. 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.

Administrative Costs

82. Significant costs (both fixed and ongoing) will be incurred by energy suppliers who will be mandated to make the payments by scheme administrators. Given the significant number of additional generators that the FITs are expected to incentivise, it seems likely that the overall administrative cost will rise. However, as FITs is intended to be a simpler mechanism than is currently available, the price of administration per small-scale installation is likely to fall relative to current levels. Further analysis is required to quantify these effects. Ofgem is also expected to play a central role in the delivery of FITs. The exact details of this role (and associated costs) have not yet been determined and will be the subject of discussions over the coming months.

Transmission losses

83. 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. These impacts have not been quantified.

Engagement

84. 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

85. The consultation document proposes 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. Metering will form a greater proportion of total costs for smaller installations relative to larger installations. Although the capital costs of meter installation have been included in the technology cost assumptions underlying the modelling they have not been comprehensively itemised. Further analysis is required on metering costs – both capital costs and ongoing meter reading costs.

Accreditation

86. An accreditation requirement for participation in FITs, (such as the microgeneration certification scheme (MCS)[27] 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.

87. 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

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

88. 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.

Annex A – FITs Tariff Levels

Table 1 – "8% ROI" scenario

PV (850kWh/kWp/yr)											
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
New build domestic (0–4kW)	£517	£480	£447	£417	£390	£365	£353	£342	£331	£321	£312
Retrofit domestic (0-4kW)	£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

50–250kW	£220	£213	£206	£199	£192	£186	£182	£179	£175	£171	£168
250–500kW	£151	£146	£141	£137	£132	£128	£125	£123	£120	£117	£115
500–5000kW	£93	£93	£92	£91	£91	£91	£90	£90	£90	£89	£89

Hydro

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
1–10kW	£240	£240	£240	£240	£240	£240	£240	£240	£240	£240	£240
10–50kW	£132	£132	£132	£132	£132	£132	£132	£132	£132	£132	£132
50–100kW	£187	£187	£187	£187	£187	£187	£187	£187	£187	£187	£187
100–500kW	£142	£142	£142	£142	£142	£142	£142	£142	£142	£142	£142
500–1,000kW	£132	£132	£132	£132	£132	£132	£132	£132	£132	£132	£132
1,000–5,000kW	£94	£94	£94	£94	£94	£94	£94	£94	£94	£94	£94

Wave

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Breakwater + Wells Turbine - 7.5kW/m	£698	£684	£670	£657	£644	£631	£622	£614	£606	£598	£590
Breakwater + Wells Turbine - 15kW/m	£349	£342	£335	£328	£322	£315	£311	£307	£303	£299	£295
Breakwater + Wells Turbine - 25kW/m	£233	£228	£223	£219	£215	£210	£207	£205	£202	£199	£197
Breakwater + Wells Turbine - 30kW/m	£175	£171	£168	£164	£161	£158	£156	£153	£151	£149	£147

Tidal

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Tidal - <2.5m/s	£258	£258	£258	£258	£258	£258	£258	£258	£258	£258	£258
Tidal - 2.5-3.5m/s	£206	£206	£206	£206	£206	£206	£206	£206	£206	£206	£206
Tidal - >3.5m/s	£172	£172	£172	£172	£172	£172	£172	£172	£172	£172	£172

Biomass (select site type)	4 - Stand-alone commercial										
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Heat turbine	£236	£189	£173	£158	£143	£130	£124	£118	£113	£107	£102
ORC	£258	£203	£189	£175	£162	£150	£143	£136	£129	£122	£115
Steam turbine CHP	£185	£142	£129	£117	£106	£95	£91	£87	£83	£79	£76
Waste											
Advanced Thermal Treatment	£59	£59	£59	£59	£59	£59	£59	£59	£59	£59	£59
AD	£90	£90	£90	£90	£90	£90	£90	£90	£90	£90	£90
Incineration	£59	£59	£59	£59	£59	£59	£59	£59	£59	£59	£59

Table 2 – lead scenario

Technology	Size	Initial tariff (£/MWh)	Degression (% per year)
PV	New build domestic (0-4kW)	£310	7%
PV	Retrofit domestic (0-4kW)	£365	7%
PV	New build 4-10kW	£320	7%
PV	Retrofit 4-10kW	£320	7%
PV	New build 10–100kW	£280	7%
PV	Retrofit 10–100kW	£280	7%
PV	New build 100–5000kW	£260	7%
PV	Retrofit 100–5000kW	£260	7%
PV	Stand alone system	£260	7%
Wind	B-M <1.5kW urban	£305	4%
Wind	B-M <1.5kW rural	£305	4%
Wind	M-M urban	£305	4%
Wind	M-M rural	£305	4%
Wind	1.5–15kW urban	£230	3%
Wind	1.5–15kW rural	£230	3%
Wind	15–50kW urban	£205	3%
Wind	15–50kW rural	£205	3%
Wind	50–250kW	£180	0%
Wind	250–500kW	£160	0%
Wind	500–5000kW	£45	0%
Hydro	1–10kW	£170	0%
Hydro	10–50kW	£120	0%
Hydro	50–100kW	£120	0%
Hydro	100–500kW	£85	0%
Hydro	500–1,000kW	£85	0%
Hydro	1,000–5,000kW	£45	0%
Wave	Breakwater + Wells Turbine - 7.5kW/m	£80	0%
Wave	Breakwater + Wells Turbine - 15kW/m	£80	0%
Wave	Breakwater + Wells Turbine - 25kW/m	£80	0%
Wave	Breakwater + Wells Turbine - 30kW/m	£80	0%
Tidal	Tidal - <2.5m/s	£80	0%
Tidal	Tidal - 2.5-3.5m/s	£80	0%
Tidal	Tidal - >3.5m/s	£80	0%
Biomass	Heat turbine	£90	0%
Biomass	ORC	£90	0%
Biomass	Steam turbine CHP	£90	0%
Waste	Advanced Thermal Treatment	£45	0%
Waste	AD	£90	0%
Waste	Incineration	£45	0%
Tariff for biomass electricity only (£/MWh)		£45	0%
Renewable heat incentive value from 2011*		£20	0%

* A RHI value for biomass CHP is modelled here for illustrative purposes only. RHI tariff levels will be part of a full RHI consultation that will be published later on in the year.

Table 3 – “community” scenario

Technology	Size	Initial tariff (£/MWh)	Degression (% per year)
PV	New build domestic (0-4kW)	400	5%
PV	Retrofit domestic (0-4kW)	400	5%
PV	New build 4-10kW	380	5%
PV	Retrofit 4-10kW	380	5%
PV	New build 10–100kW	350	5%
PV	Retrofit 10–100kW	350	5%
PV	New build 100–5000kW	300	5%
PV	Retrofit 100–5000kW	300	5%
PV	Stand alone system	300	5%
Wind	B-M <1.5kW urban	200	0
Wind	B-M <1.5kW rural	200	0
Wind	M-M urban	200	0
Wind	M-M rural	200	0
Wind	1.5–15kW urban	300	0
Wind	1.5–15kW rural	300	0
Wind	15–50kW urban	250	0
Wind	15–50kW rural	250	0
Wind	50–250kW	200	0
Wind	250–500kW	180	0
Wind	500–5000kW	143	0
Hydro	1–10kW	145	0
Hydro	10–50kW	145	0
Hydro	50–100kW	140	0
Hydro	100–500kW	140	0
Hydro	500–1,000kW	140	0
Hydro	1,000–5,000kW	120	0
Wave	Breakwater + Wells Turbine - 7.5kW/m	250	2%
Wave	Breakwater + Wells Turbine - 15kW/m	250	2%
Wave	Breakwater + Wells Turbine - 25kW/m	250	2%
Wave	Breakwater + Wells Turbine - 30kW/m	250	2%
Tidal	Tidal - <2.5m/s	250	0
Tidal	Tidal - 2.5-3.5m/s	250	0
Tidal	Tidal - >3.5m/s	250	0
Biomass	Heat turbine	160	0
Biomass	ORC	160	0
Biomass	Steam turbine CHP	160	0
Waste	Advanced Thermal Treatment	100	0
Waste	AD	100	0
Waste	Incineration	100	0

Table 4 – “non-microgen” scenario

Technology	Size	Initial tariff (£/MWh)	Degression (% per year)
PV	New build domestic (0-4kW)	165	0
PV	Retrofit domestic (0-4kW)	165	0
PV	New build 4-10kW	165	0
PV	Retrofit 4-10kW	165	0
PV	New build 10–100kW	165	0
PV	Retrofit 10–100kW	165	0
PV	New build 100–5000kW	165	0
PV	Retrofit 100–5000kW	165	0
PV	Stand alone system	165	0
Wind	B-M <1.5kW urban	165	0
Wind	B-M <1.5kW rural	165	0
Wind	M-M urban	165	0
Wind	M-M rural	165	0
Wind	1.5–15kW urban	165	0
Wind	1.5–15kW rural	165	0
Wind	15–50kW urban	165	0
Wind	15–50kW rural	165	0
Wind	50–250kW	165	0
Wind	250–500kW	165	0
Wind	500–5000kW	165	0
Hydro	1–10kW	165	0
Hydro	10–50kW	165	0
Hydro	50–100kW	165	0
Hydro	100–500kW	165	0
Hydro	500–1,000kW	160	0
Hydro	1,000–5,000kW	120	0
Wave	Breakwater + Wells Turbine - 7.5kW/m	165	0
Wave	Breakwater + Wells Turbine - 15kW/m	165	0
Wave	Breakwater + Wells Turbine - 25kW/m	165	0
Wave	Breakwater + Wells Turbine - 30kW/m	165	0
Tidal	Tidal - <2.5m/s	165	0
Tidal	Tidal - 2.5-3.5m/s	165	0
Tidal	Tidal - >3.5m/s	165	0
Biomass	Heat turbine	165	0
Biomass	ORC	165	0
Biomass	Steam turbine CHP	165	0
Waste	Advanced Thermal Treatment	100	0
Waste	AD	100	0
Waste	Incineration	100	0

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	Yes	No
Race Equality	No	No
Disability Equality	No	No
Gender Equality	No	No
Human Rights	No	No
Rural Proofing	No	No