Title: **Consultation on additional support for Scottish islands renewables** **IA No:** DECC0145 **Lead department or agency:** Department of Energy and Climate Change (DECC) **Other departments or agencies:**	**Impact Assessment (IA)** **Date:** 17/09/2013 **Stage:** Consultation **Source of intervention:** Domestic **Type of measure:** Secondary legislation **Contact for enquiries:** Mike Haslam Michael.Haslam@decc.gsi.gov.uk

Summary: Intervention and Options

RPC: N/A

Cost of Preferred (or more likely) Option				
Total Net Present Value	**Business Net Present Value**	**Net cost to business per year** (EANCB in 2009 prices)	**In scope of One-In, One-Out?**	**Measure qualifies as**
-£0.7bn by 2030	-	-	No	Tax and spend

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

Currently available evidence suggests that there is potential for electricity generation on the Scottish islands to provide renewable energy towards 2020 renewable targets. Currently, Scottish islands have very limited grid connections to the mainland. Plans are in place to upgrade the transmission network that connects the islands to the main GB grid. This will result in large costs on developers on the islands through higher transmission network charges to reflect the costs of the necessary links. Based on current evidence, without Government intervention above the levels of support proposed within the draft Electricity Market Reform Delivery Plan, these projects are not expected go ahead.

What are the policy objectives and the intended effects?

The proposed policy intervention is to provide differential support to onshore wind on the Scottish islands. By supporting potential onshore wind projects in the Scottish islands, this will offer greater flexibility in achieving renewable energy targets for 2020 and help to reduce the carbon intensity of the electricity sector.

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

The following options have been considered in this IA:

i) Do nothing: Under this option the Scottish Islands would only be eligible for the same levels of support as all other onshore wind projects across the UK.

ii) A separate strike price for Scottish islands onshore wind: Onshore wind projects on Scottish islands would be eligible for differential support, pending the outcome of this consultation. The proposed strike price for Scottish island onshore wind projects is proposed to begin in 2017/18, when projects may be able to begin generating, and is given in Table 5.

Option ii) is the preferred option, as this has the potential to help the UK meet its 2020 targets and beyond.

Will the policy be reviewed? As part of on-going EMR delivery plan process **If applicable, set review date:**					
Does implementation go beyond minimum EU requirements?			**N/A**		
Are any of these organisations in scope? If Micros not exempted set out reason in Evidence Base.	**Micro** **No**	**< 20** **No**	**Small** **No**	**Medium** **No**	**Large** **No**
What is the CO2 equivalent change in greenhouse gas emissions? (Million tonnes CO2 equivalent)			**Traded:**	**Non-traded:**	

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:	19/09/2013

Summary: Analysis & Evidence

Policy Option 1

Description:

FULL ECONOMIC ASSESSMENT

Price Base Year 2012	PV Base Year 2012	Time Period Years 19	Net Benefit (Present Value (PV)) (£m)		
			Low:	High:	Best Estimate: -700

COSTS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Cost (Present Value)
Low				N/A
High				N/A
Best Estimate				900

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

The illustrative scenario set out in the impact assessment assumes that there is additional renewables generation, replacing fossil fuels, that remains consistent with the LCF constraint. However, there is uncertainty about whether this scenario will be the case, as there are a number of plausible possibilities for meeting decarbonisation targets in 2020 and beyond. As the scenario included here gives more renewables generation than the baseline against which it is compared, it results in a negative NPV, as the monetised costs of renewables generation exceed the monetised benefits.

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

BENEFITS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Benefit (Present Value)
Low				N/A
High				N/A
Best Estimate				200

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

There is a reduction in carbon costs up to 2030 compared to the scenario set out within the impact assessment for the draft Electricity Market Reform Delivery Plan. This reflects a lower carbon intensity under the assumption that Scottish island wind generation displaces fossil fuel generation. As with the costs, there is uncertainty about whether this will be the case.

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

A key objective of the policy is to incentivise renewable generation which could contribute towards long term decarbonisation and renewable targets. This will increase the likelihood of achieving the 2020 targets. If there is more renewable electricity generation at the expense of fossil fuel generation, this would also serve to improve air quality.

Key assumptions/sensitivities/risks — **Discount rate (%)** 3.5

i) Cost and performance data, including transmission charges, for Scottish islands onshore wind projects were taken from the Baringa / TNEI report.

ii) Technology assumptions for hurdle rates and learning rates were assumed at the same level as for UK onshore wind.

iii) There is uncertainty around plant operating lifetime for Scottish islands onshore wind projects. Operating lifetime was assumed at 20 years, consistent with the Baringa/TNEI report. A sensitivity run with 23 year operating lifetime was carried out to check for impact on modelled results.

BUSINESS ASSESSMENT (Option 1)

Direct impact on business (Equivalent Annual) £m:			In scope of OIOO?	Measure qualifies as
Costs: N/A	**Benefits:** N/A	**Net:** N/A	No	N/A

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Section 1. Executive Summary

1. The United Kingdom is committed to generating around 30% of its electricity from renewable sources by 2020, as well as to reducing its greenhouse gas emissions in 2020 by 34% on 1990 levels. The draft Electricity Market Reform (EMR) Delivery Plan outlined the next steps in achieving these targets.
2. Evidence suggests that electricity generation on the Scottish islands could provide a contribution to the renewable energy targets. However, current levels of support are not expected to be sufficient due to limited connections to the main GB transmission network, which would result in large costs to developers. Based on current evidence, additional support for onshore wind generation on the Scottish Islands has the advantages of:
    a. Lower costs than offshore wind and some other low-carbon technologies that we expect to be part of the 2020 (and longer term) energy mix;
    b. Increased likelihood of meeting legally binding 2020 targets by encouraging a greater diversity of projects; and
    c. Development of wind generation in areas with broader public support and community participation than may be achievable on the UK mainland.
3. In the short term there may be a case for provision of additional support for renewable technologies on Scottish islands. The consultation on Scottish islands renewables takes forward work on how to incentivise renewable projects on Scottish islands and provide greater flexibility in achieving renewable targets in 2020, while maintaining affordability within the Levy Control Framework. Using data collected by Baringa / TNEI for projects on the islands, the consultation proposes a strike price of £115 per MWh for eligible projects, starting from 2017/18. The proposed strike price for Scottish islands is calculated as the support level required to incentivise a reasonable, and affordable, level of deployment on the islands.
4. This Impact Assessment (IA) examines the impact of the proposed strike price for onshore wind projects on Scottish islands. The impact of the proposed strike price for Scottish islands is uncertain and will depend on how the market responds to the introduction of the EMR. This IA uses the scenario as set out in the draft EMR Delivery Plan IA as the counterfactual, and the effects of the proposed intervention are measured against that.
5. The precise impact of this policy is uncertain, as with EMR more generally. As set out in the consultation on the draft Delivery Plan, which included deployment ranges for renewable technologies, there is uncertainty resulting from different underlying assumptions about future technology costs, fossil fuel prices, biomass conversions and the commissioning dates for new Carbon Capture and Storage (CCS) and nuclear plants.
6. The response to this consultation will draw on evidence received to test if there is a case for provision of additional support for Scottish islands onshore wind. This will include whether 2017/18 is an appropriate year for potential support to begin, and if a maximum of £115/MWh is justifiable based on the objectives, information and evidence set out in this IA. The response will be published as part of the final EMR Delivery Plan package.

Section 2. Strategic Overview

Rationale for support for low carbon technologies

7. As stated in the draft Delivery Plan for the Electricity Market Reform (EMR)[1] the Government is committed to meeting the legally binding decarbonisation targets as set out in the Climate Change Act 2008, and economy-wide carbon budgets. It is also committed to meeting the 2020 renewables target. The EU Renewable Energy Directive set a target for the UK for 15% of energy to be from renewable sources by 2020. This corresponds to around 30% of electricity generation coming from renewable sources by 2020.
8. New Government clauses have been added to the Energy Bill, which enable a 2030 decarbonisation target range for the power sector to be set in secondary legislation. The decision to set a target range will be taken once the Committee on Climate Change has provided advice on the 5th Carbon Budget, which will cover the corresponding period (2028 – 2032), and once the Government has set that budget, which is due to take place in 2016. The power will not be exercised until the Government has set the 5th Carbon Budget.
9. Whilst the UK is on target to reduce its greenhouse gas emissions in 2020 by 34% on 1990 levels, in line with carbon budgets and the EU target, the longer-term goals are more challenging. From 2020, further deep cuts in emissions from the power sector are likely to be necessary to keep us on target to meeting our 2050 commitments. Reducing emissions from the power sector will become increasingly important to help us decarbonise other sectors.
10. Renewable technologies are relatively new, compared to fossil-fuel fired plants. Fossil fuel generators have benefitted over many years from learning by doing and from the exploitation of economies of scale. There is evidence that given the opportunity to deploy at scale, some low-carbon technologies could reduce in cost. However, at current generation costs these technologies will be unable to compete with mature technologies, even with the support of a carbon price.
11. Therefore, in the short term there is a case for offering additional support to relatively immature low-carbon technologies to drive innovation, while the longer term aim is that renewable technologies are competitive without the need for on-going support. Given the longer-term decarbonisation objectives, more is needed to provide an environment that is sufficiently attractive for low-carbon investment and to do so at lowest cost for consumers. EMR aims to provide this environment in a cost effective way. In addition to this, the EMR aims to provide greater certainty to investors through the proposed Contract for Difference (CfD) mechanism (with proposed strike prices) as published in the draft EMR Delivery Plan. The provision of a strike price for generated electricity is expected to reduce uncertainty in revenues for investors, who are currently exposed to changes in revenues due to changes in the wholesale price of electricity. The proposals in this IA operate within the EMR framework and are expected to contribute to the same objectives outlined above.

Proposed package for the first EMR Delivery Plan

12. The proposed package for the first EMR Delivery Plan published in July 2013 set out proposals for a set of strike prices for renewable electricity technologies. As part of the package, the

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[1] Available at https://www.gov.uk/government/consultations/consultation-on-the-draft-electricity-market-reform-delivery

Government also committed to taking forward work to consider the case for provision of additional support for Scottish islands, which are not currently differentiated within the Renewables Obligation (RO) framework. The consultation document, therefore, seeks to consult on a separate, distinct strike price for onshore wind on Scottish islands i.e. on the Western Isles, Orkney and Shetland. Policy proposals for onshore wind in the rest of the UK and for all other technologies remain as in the EMR package of July 2013.

Rationale for differential support for renewables on Scottish islands

13. The analysis in the draft Delivery Plan assumed a number of different potential scenarios following the introduction of EMR, resulting in a range for projected capacity of each technology. This reflects the uncertainty about how the electricity market will respond. Therefore, future capacity of renewable technologies is uncertain, as is the pathway towards the 2020 renewables target. Given this uncertainty, there is a need to consider all forms of renewable generation that might be able to contribute towards the renewables target in 2020, as well as longer term decarbonisation of the electricity sector.
14. Based on current evidence there is scope for renewable generation on Scottish islands to contribute towards 2020 renewables target, but this is not expected to come forward under support levels for UK onshore wind proposed under the EMR. Load factors on Scottish islands are 25-57% higher on average, relative to UK averages, yet the onshore wind resource potential on the islands remains largely untapped at present.
15. While there are potential benefits to developing renewables on the islands there are also costs specific to the islands that need to be overcome. Scottish islands have very limited grid connections. Current plans are in place to upgrade the transmission network that connects the islands to the main GB energy grid. This would result in large costs on developers on the islands in higher transmission network charges, which are expected to be 17-28 times higher, compared to charges applying elsewhere in the UK[2]. In addition, onshore wind projects on the islands have higher operational costs due to greater wear and tear as result of higher wind speeds.
16. The island groups of Orkney, Shetland and Western Isles together constitute Scottish islands for the purposes of this analysis. The islands, however, differ in their characteristics. Onshore wind projects on Orkney and Shetland potentially have load factors in the range of 42-44%, while the expected load factor on the Western Isles is estimated at 35%. This compares with UK average onshore wind load factor of 28%. Transmission charges for onshore wind projects on the islands are higher than for UK onshore wind more generally. The levelised cost of transmission charges on Scottish islands adds £28/MWh to average levelised cost of UK onshore wind (relative to a project based on a UK load factor) for the Orkney Islands, £35/MWh for Shetland and £48/MWh for the Western Isles[3]. There are significant differences in revenues and costs for onshore wind projects on Orkney and Shetland compared to the Western Isles. Therefore, if Scottish islands projects are to go ahead, not only would they need to be treated differently from projects on the mainland, variation in cost and revenue on the three islands may also need to be taken into account.
17. Support levels under the RO and strike prices in the proposed EMR package are set such that the most cost effective projects for each technology are deployed. Based on our analysis using

[2] When compared against transmission charges for UK onshore wind projects commissioning in 2020, as published in the 2013 Electricity Generation Cost report.

[3] This is based on levelised cost figures from 2012. More recent levelised cost figures are available, but the corresponding breakdown is not, so the 2012 figures have been used. This is also to maintain consistency with the Baringa/TNEI report.

available information, current support levels for onshore wind, under either the RO or EMR, are not sufficient to incentivise deployment on Scottish islands which would lie at the top end of the onshore wind supply curve. However, Scottish islands projects could still make a useful contribution to meeting the 2020 targets, and while the levelised costs of the Scottish islands are higher than costs of onshore wind in other parts of the UK, the greater diversification of renewable electricity generation will give more flexibility in achieving the renewable energy target for 2020 and longer term decarbonisation of the electricity sector. In the Baringa/TNEI report, developers also reported a higher level of community support and engagement on the Scottish islands than on the mainland, thus facilitating project development. Furthermore, there are large-scale projects with planning approval on the Scottish islands that are ready to build.

18. As set out in the consultation document, the strike price is only proposed to apply from 2017/18 onwards, reflecting that no Scottish islands projects are predicted to be able to begin generating prior to 2018. A strike price may be introduced earlier if information becomes available during the consultation that changes this assumption. Beyond the first Delivery Plan, the strike price for Scottish Islands would be expected to reduce over time, reflecting the expectation that levelised costs of projects would fall and the longer term intention that renewable electricity generation becomes competitive, without support, with non-renewable generation.

Independent analysis on Scottish islands

19. The Government, in conjunction with the Scottish Government, commissioned independent analysis of the potential contribution that could be made to renewable and low carbon targets by renewables located on the Scottish islands. The report of this analysis, prepared by Baringa and TNEI, was made available on the DECC and Scottish Government websites in May 2013.[4]

20. The report's analysis shows that because of the high cost of transmission links to connect to the main GB electricity grid and other factors such as high wind speeds, there are significant cost and revenue differences on projects on Scottish islands compared to mainland projects. The report concluded that large-scale onshore wind projects are unlikely to proceed on the Scottish islands based on an onshore wind strike price based on mainland projects. However, the report states that *"the analysis suggests that Scottish Island wind could make a cost effective contribution to the 2020 renewables targets and wider decarbonisation objectives".* The extent to which the contribution is cost effective depends on the mix of technologies that can be delivered by 2020, which is uncertain. . However, due to limitations in the existing local grid network, new projects are reliant on proposed new transmission links. The report concluded that additional support would be needed to bring forward onshore wind projects on the Scottish islands.

21. Due to the very early stage of development of the marine energy sector (where current deployment is still at a prototype testing stage), there is a lack of energy data for wave and tidal energy projects. This made it difficult for Baringa/TNEI to demonstrate a clear case for island-specific support for marine energy. Instead, the report suggests because of the emerging nature of the technology, marine projects on the islands and elsewhere in the UK will require at least the level of support provided by the RO (and the equivalent available under CfDs) for the first commercial scale projects. However, we would anticipate that a similar level of additional cost to onshore wind would be associated with Scottish Island projects compared to those located on the mainland.

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[4]https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/199038/Scottish_Islands_Renewable_Project_Baringa_TNEI_FINAL_Report_Publication_version_14May2013__2_.pdf

22. The report also found that the development of renewables generation on the islands could have significant benefits to the local economies, through direct, indirect and induced jobs. However it is not clear how much of this impact would be displaced from other locations. According to the report, jobs created in the wind sector are likely to be primarily due to displacement of jobs from other areas to the islands, while a successful marine industry could lead to a significant number of direct jobs. In addition to this, the report found that renewable generation and associated transmission links could also provide further benefits related to local security of supply.

Affordability

23. The cost of support for renewable technologies is ultimately passed through to energy consumers as part of energy bills. Government-mandated expenditure on renewables operates within a framework that places limits on the amount recovered from energy bills. This framework is called the Levy Control Framework (LCF). The LCF specifies the maximum allowable spending on levy-funded policies and thereby helps protect energy consumers from excessive levies on their energy bills.

24. As part of the total EMR package, the proposals in this document are also subject to the agreed LCF published alongside the draft EMR Delivery Plan. The LCF sets the overall affordability framework for support for low carbon electricity generation. The table below shows the LCF profile to 2020/21 which sets the upper limits on the levies raised to fund electricity policies.

Table 1: Upper Limits to Electricity Policy Levies, 2011/12 prices

2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
£4.30 bn	£4.90 bn	£5.60 bn	£6.45 bn	£7.00 bn	£7.60 bn

25. The impact of the proposal in this document on consumer electricity prices and bills is discussed in section 6 below.

After 2020

26. The impact on deployment and spend as a result of the proposed policy for Scottish islands is presented to 2020/21. The LCF, as set out above, is currently set to 2020/21, and arrangements for the Framework beyond this period have yet to be made. The impact on welfare of the proposed policy for Scottish islands is discussed in section 6 below.

Section 3. Problem under consideration

27. Currently available evidence shows that Scottish islands onshore wind is more expensive than onshore wind projects on the mainland, primarily due to the high cost of transmission links to connect to the main GB electricity grid. However, Scottish islands projects are estimated to be less expensive than some other low carbon technologies. There is therefore the possibility to provide additional support to Scottish islands onshore wind, greater than the support level offered to UK mainland onshore wind projects, which could help meet renewable energy targets in a cost-effective way.

28. Independent studies have estimated the following as total 'practical'[5] resource potential across Western Isles, Orkney and Shetland:

Table 2 – Total practical resource potential of onshore wind on Scottish islands

Orkney	Shetland	Western Isles
Up to 0.9 TWh/year	Up to 7 TWh/year	Up to 1.7 TWh/year

29. However, according to the Baringa/TNEI report, Scottish islands currently have either very limited grid connections to the mainland or none at all, so connections for renewable energy are limited by the local load demands and balancing of island systems until large transmission infrastructure projects are constructed. Currently the local transmission owner, SHE-T, plans to upgrade transmission links to connect Scottish islands to the mainland. Baringa/TNEI estimated a central deployment scenario by 2020, based on the ability of projects to connect via proposed transmission upgrades. This scenario assumes deployment of 1040 MW of onshore wind capacity on Scottish islands by 2020 under the assumption that required incentives are in place.
30. According to information gathered from industry, the earliest completion date for proposed transmission upgrades connecting Scottish islands to the mainland is 2018 for the link to the Western Isles and 2019 for the links to Orkney and Shetland.
31. Based on this update, DECC has estimated a deployment scenario of onshore wind projects on the Scottish islands over the period 2018-2020, under the assumption that required incentives were in place i.e. expected revenue is sufficient to incentivise deployment. This scenario takes into account the capacity available for transmission over proposed links between islands and mainland Scotland. This is a simplification used for modelling and is informed by, but does not accurately reflect, the scale of actual projects.
32. This deployment scenario was used to set the build rates for Scottish islands onshore wind and was used to inform the analysis in this IA. The scenario is given in the table below.

Table 3 – Cumulative maximum build (GW) for Scottish islands onshore wind

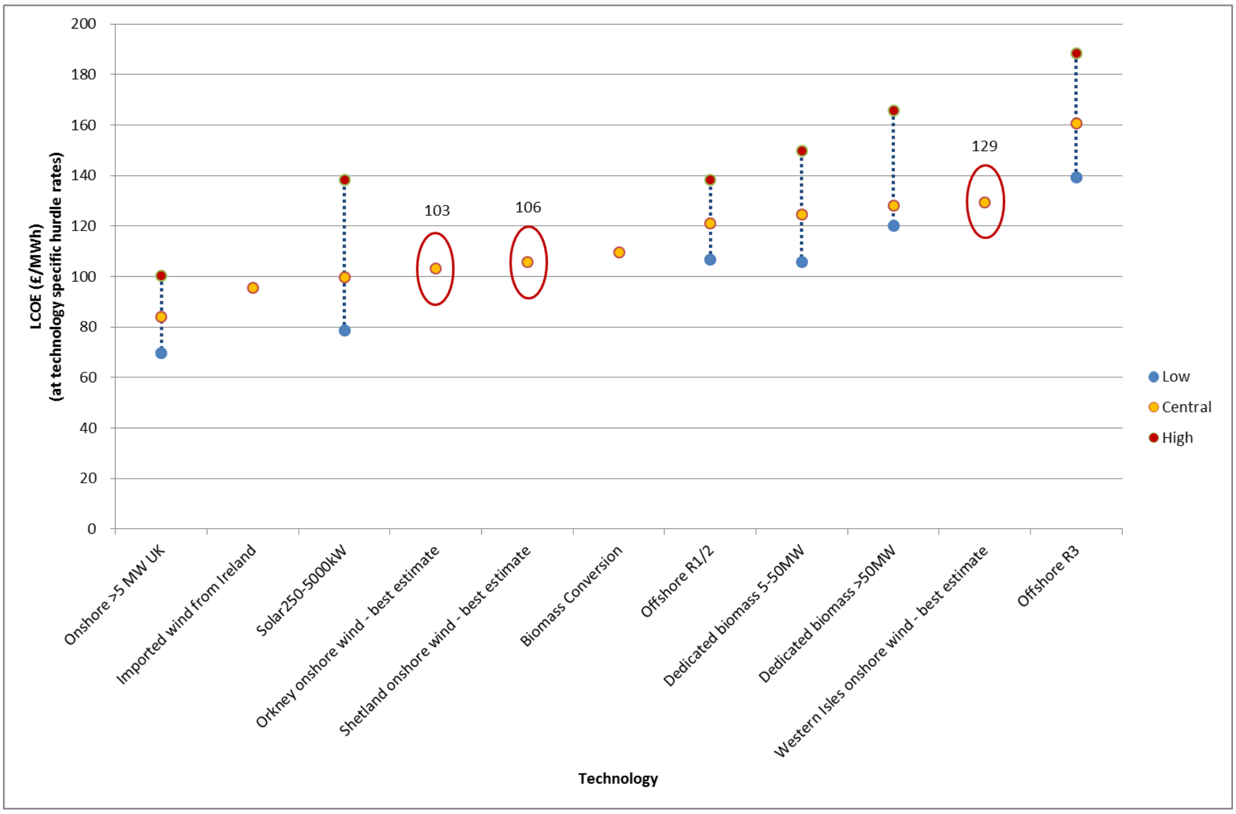
	2018	2019	2020	Baringa/TNEI central deployment scenario in 2020
Orkney	-	-	0.1	0.04
Shetland	-	0.3	0.6	0.6
Western Isles	0.2	0.4	0.4	0.4

While the Baringa/TNEI report estimated 40MW of potential capacity on the Orkney Islands, this is increased to 100MW for the purposes of the modelling. This is a simplifying assumption to reduce the complexity and improve the functionality of the model.

[5] Practical' in this context follows the Carbon Trust definition of the total resource after taking into account realistic locations, cost of energy as well as locational and environmental constraints

33. Baringa/TNEI estimated that the cost of renewables on the Scottish islands is higher than comparable projects on the mainland, and as a result major developments are unlikely to be viable at current support levels, but less than some other low carbon technologies that we expect to be part of the future electricity mix. The Baringa/TNEI report set out that the Levelised Cost of Energy[6] (LCOE) was £103-106/MWh for Orkney and Shetland, and was £129/MWh for Western Isles. This compared to a figure of £84/MWh for onshore wind more generally[7]. This is illustrated in the figure below, taken from the Baringa/TNEI report.

Figure 1 – LCOE for Scottish islands and for other technologies at technology specific hurdle rates[8] for projects commissioning 2020[9]



[6] LCOE is defined as the net present value of total capital and operating costs of a plant divided by the net present value of the net electricity generated by the plant over its operating life. The 2013 Electricity Generation Costs update estimated a levelised cost of £88/MWh for onshore wind projects >5MW across the UK, commissioning 2020. The Baringa/TNEI report used a levelised cost figure of £84/MWh, which was the corresponding figure for 2012. Both of these figures are central estimates, using technology-specific hurdle rates.

[7] The 2012 Electricity Generation costs report estimated that the LCOE for onshore wind projects commissioning in 2012 would be £84/MWh. This estimate was increased slightly to £88/MWh in the 2013 report. The 2012 figures have been used for the comparison here for consistency with the Baringa/TNEI report. While the magnitude of the total difference has changed, the reasons for the differences between costs for onshore projects and projects across the rest of the UK have not. When calculating strike prices, the most up-to-date figures have been used.

[8] LCOE for Scottish islands and for other technologies at 10% hurdle rates is provided in Annex 1.

[9] LCOE for technologies other than Scottish onshore wind is taken from the 2012 Electricity Generation Costs report https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/65713/6883-electricity-generation-costs.pdf

34. There are two main drivers of higher operation costs on Scottish islands. According to the Baringa/TNEI report, high wind speeds on the islands are expected to result in a higher frequency of repairs and greater wear and tear, leading to an increase in maintenance costs. In addition to this, insurance costs are higher on the islands. This is because the nature of the proposed transmission links between mainland Scotland and the islands (single circuit and long sub-sea cables) adds to the probability of outages, leading to an increase in the risk associated with Scottish islands onshore wind projects, and therefore higher costs.

35. However a higher load factor on the islands has the opposite impact on LCOE. The table below summarizes the impact of higher transmission charges, operational costs and load factor on LCOE of the islands, relative to the LCOE of UK onshore wind. As above, these figures are based on the 2012 comparison that was included within the Baringa report, as this report was published before the 2013 Electricity Generation costs were published.

Table 4 – Impact of transmission charges, operation costs and load factor of Scottish islands on LCOE of UK onshore wind

	Impact on LCOE of UK onshore wind due to Scottish islands..					
	Transmission charges	Operational cost	Capex	Pre-development and construction lifetime	Load factor	Overall impact
Orkney	+28	+ 22	+9	+5	-45	+19
Shetland	+35	+26	+9	+5	-53	+22
Western Isles	+48	+10	+9	+6	-27	+46

This table is taken from information included in the Baringa/TNEI report, and compares the levelised cost figures for the Scottish islands with figures from the 2012 Electricity Generation Costs update, as the 2013 update had not been published when the Baringa/TNEI report was published.

36. One of the main costs applicable to electricity generation in Scottish islands - the Transmission Network Use of System (TNUoS) charge is currently being considered as part of Ofgem's independent review of the transmission charging regime, Project Transmit, which is nearing a conclusion. Ofgem published its preferred approach for changes to the regime including how to connect generators on the Scottish Islands on 1 August. Its minded-to statement and an impact assessment is the subject of a consultation that closes on 28 September and it expects to make a final decision in time to implement the new approach in April 2014. Ofgem's preferred approach for the Scottish Islands is the most cost effective of the options that were under consideration.

37. Pending the outcome of Project Transmit, National Grid provided Baringa/TNEI with a range of TNUoS charges potentially applicable to projects on Scottish islands. The analysis in this IA makes use of the same range of charges. As in the report, the central estimate in this IA uses a '100% converter costs' scenario, which assumes that the converter station costs are not socialised across GB. This is a precautionary (high) estimate and also the likely outcome of Project Transmit reflecting Ofgem's preferred approach to changes to the transmission charging regime, as published for consultation on 1 August 2013, is modelled on the same scenario. A different outcome for potential TNUoS charges, for example a lower estimate of TNUoS applicable on Scottish islands, will result in a fall in the estimated levelised cost of Scottish islands onshore wind, and, therefore the level of support needed to incentivise investment.

38. Therefore, due to the expected high transmission charges and operation costs applicable to projects on the islands which are not entirely offset by higher revenues due to greater wind speeds, projects on the islands are not expected to come forward under support levels proposed for onshore wind, which have been set at levels appropriate for mainland projects. This is referred to as the ‘funding gap’ in the Baringa/TNEI report. However, the presence of a funding gap alone does not justify additional support for Scottish islands.

39. Based on current evidence, the analysis in this document shows that there is potential in the Scottish islands to develop large projects, and that this potential can be delivered in a way which meets the objectives listed above. This is discussed in more detail in the following sections.

Section 4. Options under consideration

40. The purpose of the Baringa/TNEI report was not to make specific policy recommendations but outline some policy options for Government to consider. The options outlined in the report are given below, along with an explanation for why these were not taken forward, as a result of which they have not been considered in this IA.

41. *Adjustments to transmission charging methodology:* One option to address the funding gap for Scottish islands was to make changes to the transmission charging methodology. The regulation of transmission charging, including the outcome of Project Transmit is a matter for Ofgem under the EU Third Energy Package. The Government does not propose to deliver additional support for island renewables by intervening in the transmission charging regime, for example through an order under section 185 of the Energy Act 2004. Government has limited powers to intervene in the transmission charging regime which is a duty for the independent regulator.

42. *Renewables Obligation:* One option for providing additional support for the Scottish islands would be for the Scottish Government to amend the Renewables Obligation Order (Scotland) to designate specific RO Bands for groups of onshore wind projects. However, since the majority of island projects are expected to be complete after 31 March 2017, (the proposed date for closure of the Renewables Obligation to new projects) additional support through the Renewables Obligation it is not a viable option.

43. The options considered in this IA, as part of the consultation on proposals to provide differential support for Scottish onshore wind projects are presented below:

Option 1 – Do nothing

44. Under this option the proposed EMR package for onshore wind projects on Scottish islands will remain as given in the proposed EMR package published in July 2013 i.e. onshore wind projects on Scottish islands will receive the same strike price as onshore wind projects in the rest of the UK. Under this option no Scottish islands onshore wind projects are anticipated to come on by 2020 based on current evidence. As discussed in paragraph 52 below, this is also the counterfactual for the analysis in this IA.

Option 2 – Separate strike for Scottish islands onshore wind (preferred option)

45. Under this option onshore wind projects on Scottish islands would be eligible for differential support, pending the outcome of this consultation. The proposed support levels, and timing when the strike prices would be available, are set out below:

Table 5 - Proposed strike price for onshore wind on Scottish islands

	2017/18	2018/19
CfD Strike Prices (£/MWh, 2012 prices)	115	115

46. The strike price is set as the minimum level of support that could be required for some projects on the Scottish islands to start generating. A strike price of £110/MWh is not thought to be sufficient, based on current evidence.

47. Beyond the first Delivery Plan period, the strike price for Scottish islands would be set alongside strike prices for all other technologies.

48. The methodology used to calculate the proposed strike price for Scottish onshore wind is consistent with the draft EMR Delivery Plan. The analysis in this IA is based on modelling runs from the Dynamic Dispatch Model (DDM) using strike prices set out in

49. Table **5** above.

50. The proposed strike price for Scottish islands is set at the minimum support level estimated to be required to incentivise a reasonable level of deployment on the islands that would be affordable under the LCF. The proposed strike price aims to bring forward a range of projects at the lower end of the spectrum i.e. projects that would minimise cost to consumers and would not over-compensate developers.

Option 3: separate strike prices for Orkney / Shetland islands, and for Western Isles

51. There is also the option of having differential strike prices across the Scottish islands. This would be in the form of one that applies to the Orkney and Shetland Islands, and a separate, higher strike price for the Western Isles. However, this is not thought to be a viable option as, based on current evidence, the strike price that would be required for generation in the Western Isles using current information about the levelised costs - £140/MWh – compares unfavourably with the strike prices for marginal renewable electricity technologies proposed over the period of the first Delivery Plan. To illustrate, a strike price of £140/MWh is greater than the proposed strike price for offshore wind (£135/MWh) in 2018/19, when generation in the Western Isles is thought to be able to begin. This would not represent value for money for consumers, and therefore, this has not been further considered as a viable option.

Section 5. Analytical approach

Counterfactual

52. Given the uncertainty in how the market will respond to the introduction of EMR, the draft Delivery Plan IA sets out a number of different scenarios to model the potential impact of the proposals within EMR. To estimate the potential effects of introducing a separate strike price for onshore wind in the Scottish islands in this IA, we have used the 100g reference scenario presented in the EMR IA as the baseline.[10] The counterfactual for this analysis is therefore implementation of the draft Delivery Plan proposals as set out in the EMR Consultation which is also the do-nothing option in this IA as stated in paragraph 444 above. However, the precise

[10] More detail is available at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/197904/cfd_ia_may_update.pdf

impact of this is uncertain: the draft Delivery Plan presented a range of possible scenarios, and included ranges around deployment for most technologies. The aim was to estimate likely effects of the introduction of EMR, as well as being clear that there is uncertainty about exactly what the situation is likely to be in 2020/21. This uncertainty includes costs of particular technologies, potential projects that could come forward and how the market may respond to the introduction of EMR.

53. The analysis in this IA is based on the following assumptions:

    I. A carbon emissions intensity of around 100 gCO_2/kWh for the power sector in 2030;

    II. The central fossil fuel price scenario taken from the 2013 update to DECC's annual fossil fuel price projections[11]; and

    III. A post 2030 carbon price scenario in which the carbon price is assumed to rise above the carbon price floor from 2030 onwards (under the auspices of a global deal on climate change action with a global carbon market).

54. In the EMR 100g scenario set out in the EMR IA, 31.9% of total electricity generation in 2020 is from renewable sources. There is no expected deployment of Scottish islands onshore wind in this scenario. This is given in Table 7 below.

55. Assumptions about hurdle rates, operational lifetime and other factors used for the analysis in this IA are set out in Annex 2.

Section 6. Cost benefit analysis

Modelling results

56. In the central scenario in the Baringa/TNEI report, the total deployment potential of onshore wind on Scottish islands, taking into account all viable projects on the islands, is estimated at 1.04GW by 2020. For purposes of modelling this has been revised to 1.1GW worth of potential projects, which represents a simplification to reduce the complexity and increase the functionality of the modelling. However, as discussed above, the level of support required to bring forward all viable projects is unjustifiable.

57. Under the modelling, the proposed strike price of £115/MWh for onshore wind on Scottish islands over the period in the first Delivery Plan is expected to lead to 0.4 GW of Scottish onshore wind deployment, which would result in generation of 1.5 TWh per year. The precise level of deployment of Scottish island onshore wind is uncertain, and will depend on reduction in costs of onshore wind and other technologies, as well as on the deployment levels of other technologies.

Table 6: Expected deployment and generation

	Cumulative deployment (GW)	Full year Generation (TWh)
Total Scottish islands onshore wind	0.4	1.5

[11] https://www.gov.uk/government/publications/fossil-fuel-price-projections-2013

58. The support cost incurred to incentivise 0.4 GW of Scottish onshore wind deployment by 2020 is shown in the table below. The total expenditure incurred within this scenario remains consistent with the LCF constraint.

Table 7 – Description of scenarios considered in this IA

Scenario	Scottish islands generating capacity	Total renewable electricity generation (% of total generation)	Consistent with LCF constraint?
EMR IA	0 GW	31.9%	✓
EMR IA with separate strike price for Scottish islands (£115/MWh)	0.4 GW	32.4%	✓

59. The precise effects are uncertain. This includes about how the market responds, as well as about what happens with costs of generation of renewable electricity between now and 2020 (and beyond). The scenario set out above, where there is an additional strike price for Scottish islands, maintains the deployment levels of other renewable technologies. Under this scenario, the Scottish islands projects are funded through increasing LCF spend, but remaining consistent with the overall LCF constraint. The total additional funding required is estimated to be approximately £80m.[12] This additional funding is relatively small compared to the size of the LCF, representing approximately 1% of the maximum allowable spend on levy-funded policies, as set out in Table 1 above.

60. However, given the uncertainty in how the market responds to the introduction of EMR it is possible that a different albeit higher percentage of renewables in the generation mix could result in additional spend and this may need to be managed under LCF governance. Similarly, if there are more projects on the Scottish islands that could potentially happen, then this will also need to be managed. Within CfDs, and as set out in the *EMR: Contracts for Difference – Allocation Methodology for Renewable Generation* document,[13] this will begin with a first-come-first served process, followed by allocation, and then constrained allocation. Potential projects on the Scottish islands would be assessed in the same way as all other applications under allocation.

Net present value of proposed policy for Scottish islands

61. The following table presents the net present value (NPV) of the proposed policy for Scottish islands, relative to the EMR IA 100g scenario.

[12] Alternative scenarios may bring on greater (or less) renewable generation on the Scottish islands, which would cost correspondingly more or less. If this was likely to breach the LCF constraint, then this would need to be managed within the overall LCF governance.

[13] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/226976/Allocation_Methodology_-_MASTER_-_6_Aug_v_FINAL.pdf

Table 8: Net present value of the Scottish islands strike price and its effects

		NPV, £bn (real 2012)	
		2012 to 2020	**2012 to 2030**
Net Welfare	Carbon costs	0.0	0.2
	Generation costs	0.0	-0.1
	Capital costs	-0.1	-0.6
	System costs	-0.1	-0.2
	Unserved energy	0.0	0.0
	Interconnectors	0.0	0.0
	Unpriced carbon (appraisal value)	0.0	0.0
	Change in Net Welfare	**-0.2**	**-0.7**

62. The above table sets out the impact on net welfare, as assumed and modelled with the additional strike price for the Scottish islands, that is consistent with the upper limit of the LCF. The modelling assumes that additional generation on Scottish islands displaces fossil fuel generation. This displacement effect is a hypothetical modelling outcome and has been used to model the impact of the proposed policy, relative to the EMR 100g scenario. The monetised net present value of the proposed strike price for the Scottish islands is negative in this scenario. The actual impact of the proposed policy may be different and will depend on the resulting generation mix in the post EMR implementation world.

63. The main driver of the effect on net welfare is the change in capital costs required compared to the counterfactual to deliver the additional renewable capacity. However, this ignores three additional benefits. The first is the possibility that incentivising additional renewable generation capacity (and remaining consistent with the LCF constraint) provides greater flexibility in how the UK could meet its renewables targets for 2020 across all sectors. The second is that renewable generation capacity on Scottish islands could help to reduce carbon costs beyond the period modelled above, when savings from reduced carbon emissions are more significant than in the immediate term. A third potential benefit is the improvement in air quality as a result of an increase in renewable electricity generation at the expense of fossil fuels within the generation mix. These effects have not been quantified in the current analysis, but all three would serve to improve the NPV of the proposed intervention.

64. The proposed strike price for Scottish islands is to encourage some projects on the islands to come forward. In the illustrative scenario set out above, this would result in greater renewable electricity generation by 2020, relative to the scenario presented in the draft Delivery Plan, while remaining consistent with the LCF threshold.

65. However, this scenario is illustrative and there is uncertainty about whether this would be the case. The above represents one particular scenario, whereas there are numerous plausible scenarios about deployment in 2020 and beyond for the UK to meet its carbon reduction goals. There is also uncertainty about the situation for different renewable electricity technologies in 2020 and beyond, as shown by the deployment ranges set out in the draft Delivery Plan.

66. If, rather than the illustrative scenario set out above, projects on the Scottish islands enabled the UK to meet its targets at a lower cost within the LCF than would otherwise be the case, this

would be a positive NPV relative to the scenario set out within the EMR IA. If instead it was more expensive than would otherwise be the case, this would give a negative NPV. Both of these scenarios assume that total renewables generation remains the same. In practice, this is difficult to model precisely due to the prevailing uncertainties around how the market responds to the introduction of EMR.

Price and bill impacts

67. The impact of the proposed policy for Scottish islands on electricity price and bills is assessed relative to the EMR IA 100g scenario and the illustrative scenario described above. The proposed policy affects electricity bills in two ways:

    I. Support costs: CfD low-carbon payments and capacity payments which are assumed to be passed through to electricity bills by energy companies who incur the costs.

    II. Wholesale price effect: Wholesale prices could change as a result of a change in the generation mix and capacity margins.

68. An increase in support costs for renewable technologies, assuming everything else remains the same, will increase retail prices against the counterfactual, as it is assumed that support costs are passed on to consumers by suppliers. However, an increase in support costs that increases deployment of renewables will help to reduce wholesale prices due to avoided carbon and fuel costs, compared to the counterfactual.

69. Given the relatively small scale of onshore wind renewable electricity generation on the Scottish islands, there is limited impact on electricity prices, relative to the EMR IA 100g scenario. The impact of the proposed policy on bills is shown in Table 9 and

70. Table 10 below. There is a rounded impact of up to £1.0 per year on household electricity bills over the period 2021-2025, compared to the EMR IA 100g scenario. The impact on household electricity bills is very small (less than an average of 50p per year) over the remaining periods (2016 to 2020 and 2026 to 2030).

Table 9 – Domestic bill impacts (change under proposed policy in the two scenarios, compared to the EMR IA 100g scenario – five year average)

	Household, £ rounded (%) real 2012 prices
2016-2020	<0.5 (+0.0%)
2021-2025	+1.0 (+0.1%)
2026-2030	<0.5 (+0.0%)
2016-2030	<0.5 (+0.1%)

71. The impact of the proposed policy on electricity bills for non-domestic consumers and energy intensive users is also limited, as shown in

72. Table below.

Table 10 – Non-domestic and Energy Intensive user (change under proposed policy compared to the EMR IA 100g scenario – five year average)

	Percentage impacts	
	Non-Domestic (with CRC)[14]	Energy Intensive Industry (EII[15])
2016-2020	0.0%	0.1%
2021-2025	0.2%	0.2%
2026-2030	0.0%	0.0%
2016-2030	0.1%	0.1%

73. As stated in previous sections the final expected spend for Scottish islands onshore wind generation will depend on how the market responds to the introduction of EMR. The impact on electricity bills presented above is illustrative and is based on the hypothetical modelling outcome where Scottish islands onshore wind generation displaces fossil fuel generation. If Scottish island onshore wind generation resulted in displacement of more expensive electricity generation, there could be a fall in electricity bills.

Job impacts

74. Development of onshore wind projects on Scottish islands could result in benefits to the local areas through an increase in direct, indirect and induced jobs. Construction and operation of wind farms as well as developments in the supply chain could result in an increase in employment on the islands, as well in Scotland and the UK more widely.

75. Baringa/TNEI estimated the potential for Full Time Equivalent (FTE) employment on the islands as a result of planned onshore wind projects on the three island groups. However it is not clear how much of this potential would be a result of displacement in other locations or other sectors. The figures presented in the Baringa/TNEI report are based on the deployment scenario in the report, which assumes 1.04 GW of deployment by 2020. Since our modelling results suggest a lower level of deployment by 2020, this is expected to result in fewer jobs being supported compared to the number in the Baringa/TNEI report. In the event of displacement or reduced deployment of other technologies, an increase in jobs supported on the islands will result in displacement effects elsewhere i.e. either a decrease in jobs associated with the technology displaced or a decrease in jobs in other locations in the UK.

76. There is uncertainty around the extent to which jobs are displaced in other (non-power) sectors, and also the extent to which there is leakage of jobs outside the UK. Any net economic impact will be dependent on these factors.

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[14] CRC participant consuming around 10,000-11,000MWh of electricity each year.

[15] Illustrative energy intensive user consuming around 96,000 MWh of electricity each year.

Other impacts

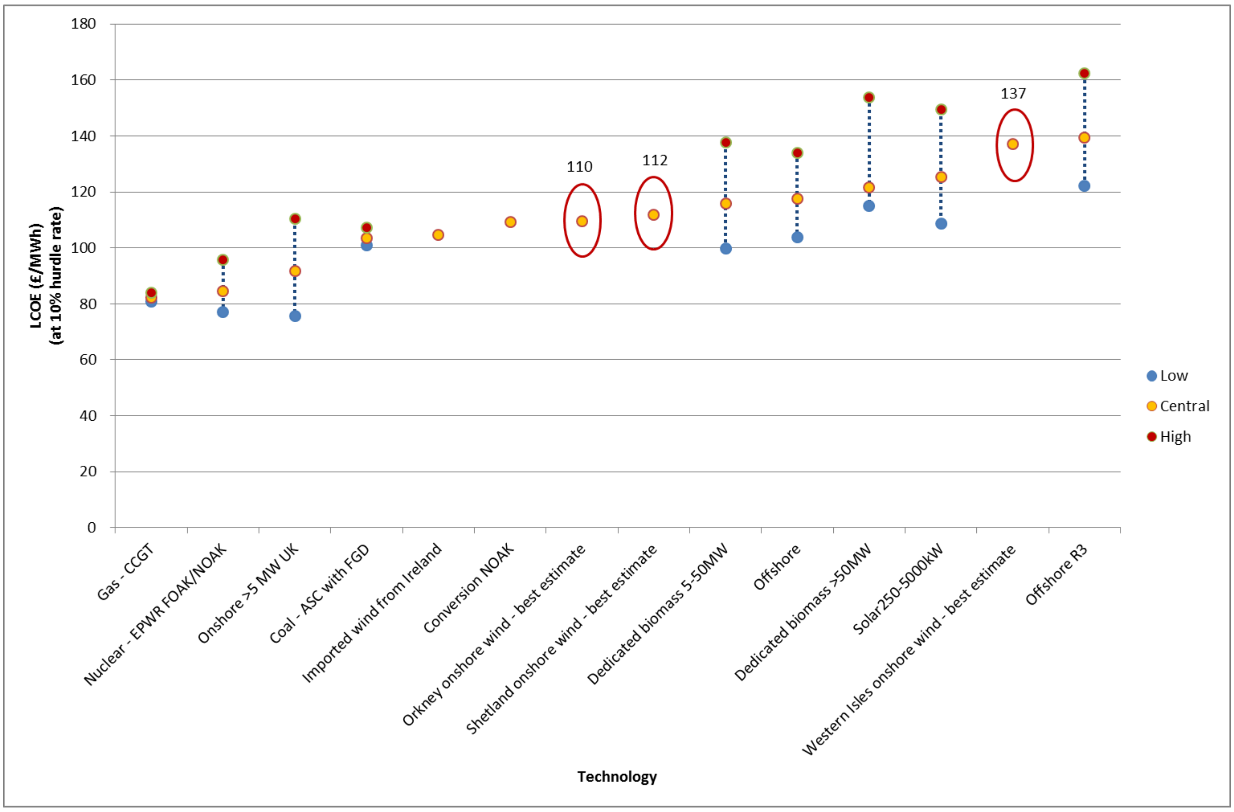
77. Additional support for Scottish onshore wind projects will assist developers to come forward in time for the transmission owner to build proposed links. This will lead to the availability of additional capacity over proposed transmission links for renewable projects to connect in the long term. Therefore, this can result in additional renewable generation in the long term, and will contribute towards long term decarbonisation and renewable targets.
78. Renewable generation and associated transmission links could provide further benefits to local security of supply and the cost of local generation. Onshore wind generation could contribute towards meeting some of the energy demand on islands such as Shetland, where most of the current demand is met by a diesel generator due to be replaced in the next few years. The additional support for onshore wind projects could, to an extent, offset the need for additional support required to replace the generator on Shetland at a later date. In addition, the existence of transmission links that would facilitated by the renewables deployment is likely to reduce the cost of delivering energy security.

Section 7. Conclusion

79. Based on current evidence, our modelling predicts that this policy will result in renewable capacity on Scottish islands of around 400 MW by 2020, generating 1.5 TWh per year. In the illustrative scenario modelled above, the additional expenditure associated with renewable capacity on Scottish islands is within the total LCF expenditure. However, the net impact of this Scottish islands onshore wind deployment is uncertain and will depend on how the market responds to the introduction of EMR more broadly.
80. If deployment of other technologies remains unchanged, as set out in the illustrative scenario of this IA, the impact of additional support for Scottish islands onshore wind projects is more renewable electricity generation, which would contribute to the 2020 renewable energy generation target. Based on current information, this is expected to be consistent with the LCF expenditure profile set out in Table 1, though this would be at a marginally greater cost to the consumer, as set out in Table 9.
81. The response to this consultation will draw on evidence received to test if there is indeed a case for provision of additional support for Scottish islands onshore wind, whether 2017/18 is an appropriate year for potential support to begin, and if a maximum of £115/MWh can be justified based on the objectives outlined in this IA. The response will be published as part of the final EMR Delivery Plan package.

Annex 1 – Levelised cost for Scottish islands onshore wind at 10% hurdle rates

Figure 2 – LCOE for Scottish islands and for other technologies at 10% hurdle rates for projects commissioning 2020[16]. As with Figure 1 in the main document, this is based on the 2012 Electricity Generation costs report, which has since been superseded by the 2013 version. This chart, comparing figures in 2012, is included for consistency with the Baringa report.



[16] LCOE for technologies other than Scottish onshore wind is taken from DECC's generation cost report 2012 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/65713/6883-electricity-generation-costs.pdf

Annex 2 - Modelling assumptions

1. Cost and performance data: In order to inform the analysis for Scottish islands, Baringa/TNEI collected data on cost and performance for Scottish island projects directly from developers. A 'best estimate' for an onshore wind project on each island was constructed using this data[17]. Cost and performance data for Scottish island projects is given in Annex 3.
2. Onshore wind supply curve: A supply curve of projects is constructed for each technology in order to model deployment for a given support level. The onshore wind supply curve used to model deployment under the RO and CfDs was used for the analysis in this IA. It is uncertain if the onshore wind supply curve, informed from the ARUP analysis published alongside the RO banding review, includes projects on the Scottish islands. Therefore, in this scenario, onshore wind build assumptions used in analysis supporting the draft EMR Delivery Plan[18] are unchanged, with Scottish islands onshore wind modelled as separate technologies offering additional build potential.
3. Hurdle rates and learning rates: Technology assumptions such as learning rates and hurdle rates were not available for the islands and were assumed to be at the same level as UK onshore wind. Learning rates used in the analysis are consistent with the RO banding review and the draft EMR Delivery Plan. Hurdle rates are based on updated assumptions used in the draft EMR Delivery Plan. It is possible that hurdle rates for Scottish islands are greater than mainland projects because of the additional uncertainty regarding the availability of connection to the grid as well as the cost of using transmission links. The nature of the links proposed (single circuit and long subsea cables) adds to the probability of outages, leading to a further increase in the risk associated with Scottish onshore wind projects. This potential increase in risk has been internalised through an increase in insurance costs of Scottish Island projects, compared to mainland projects.
4. Transmission charges: Analysis in this IA assumes transmission charges as provided by National Grid to Baringa/TNEI. The charges are specific for each island and assume 100% of converter costs are passed through to developers. This is Ofgem's preferred approach to changes in the transmission charging regime as discussed above in paragraph 377. There is scope to adjust final strike prices if required in the event of a change in Ofgem's preferred approach.
5. Plant operating lifetime: Plant operating lifetime for Scottish islands onshore wind is modelled at 20 years, consistent with the Baringa/TNEI analysis. This is shorter than the 24 year lifetime assumed for UK onshore wind in the RO banding review. The shorter lifetime for Scottish islands onshore wind is expected due to greater wear and tear as a result of high wind speeds and adverse weather conditions. This is expected to reduce the operational lifetime of Scottish onshore wind, relative to mainland onshore wind. There is a possibility that plant operating lifetime for Scottish onshore wind is longer than 20 years, and they may be more comparable with offshore wind projects, with an estimated lifetime of 23 years. We have estimated strike prices using a 23-year project lifetime, and our modelling, with all other assumptions unchanged, shows a negligible impact on the outcomes presented above.

[17] For more information see/refer to the Baringa/TNEI report: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/199038/Scottish_Islands_Renewable_Project_Baringa_TNEI_FINAL_Report_Publication_version_14May2013__2_.pdf

[18] For more information refer to the National Grid report: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/223655/emr_consultation_annex_e.pdf

6. Contract length and Power Purchasing Agreements (PPA): The contract length for Scottish islands is assumed to be 15 years as in the draft EMR Delivery Plan for all technologies. PPA discounts for Scottish islands onshore wind is the same as for UK onshore wind in the draft EMR Delivery Plan.
7. Treatment of the three islands in the DDM model: As mentioned above in paragraph 16 the three islands considered here - Western Isles, Orkney and Shetland - vary in their distance from the main GB transmission grid as well as their load factors. Therefore a single strike price will not bring about the same level of deployment on all three island groups. Of the three island groups, projects on Orkney and Shetland are similar i.e. have similar LCOE as stated above due to similar TNUOs charges and load factors, while projects on the Western Isles face much higher TNUOs charges and have lower load factors. Therefore a given strike price for onshore wind on Scottish islands is expected to result in a similar rate of return for developers on Orkney and Shetland, and a much lower rate of return for developers on the Western Isles. For the analysis in this IA, the three island groups have been treated separately in the DDM model.

Annex 3 – Cost and performance data for Scottish islands onshore wind and UK onshore wind projects

2012 prices	Commissioning 2020				
	Onshore wind				
Cost driver	**Unit**	**Shetland Islands**	**Orkney Islands**	**Western Isles**	**UK**
Load factor	%	44%	42%	35%	28%
Capital costs	£/kW	1,800	1,800	1,800	1,130 to 1940
Fixed operating costs (including insurance)	£/MW	99,000	89,000	58,000	40,210
Connection and UoS charges	£/MW/year	96,630	79,930	129,392	4,510
Variable O&M	£/MWh	3	3	3	5
Plant operating lifetime	Years	20	20	20	24

Note: i) Data for Scottish islands onshore wind was published in the Baringa/TNEI report[19]; data for UK onshore wind was published in the 2013 Electricity Generation Costs report[20]. ii) Variable O&M for Scottish islands onshore wind was assumed to be the same as for UK onshore wind, as published in the 2012 Electricity Generation Costs report. More recent cost figures for UK onshore wind, published in the 2013 Electricity Generation Costs report and the Government Response to the UK onshore wind call for evidence, were not available at the time.[21]

[19] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/199038/Scottish_Islands_Renewable_Project_Baringa_TNEI_FINAL_Report_Publication_version_14May2013__2_.pdf

[20] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/223940/DECC_Electricity_Generation_Costs_for_publication_-_24_07_13.pdf

[21] For an explanation of the revised estimate for UK onshore wind O&M costs refer to the Government Response to the UK onshore wind call for evidence, available at:

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/205423/onshore_wind_call_for_evidence_response.pdf