GREEN GB WEEK
BUILDING THE UK'S CLEAN FUTURE TOGETHER

MACQUARIE

Green Investment Group

Green impact report

Offshore Wind: United Kingdom

Green Impact Report

Offshore Wind: United Kingdom

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1. Introduction

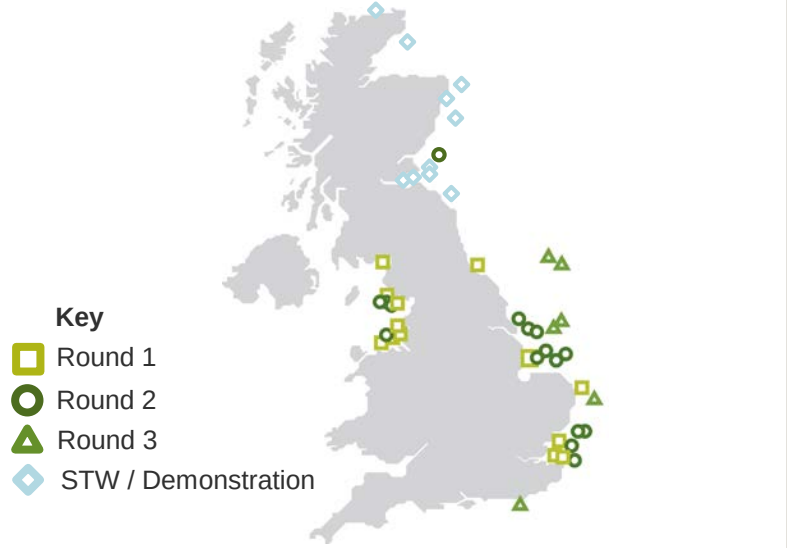
The Green Investment Ratings ('GIR') team of Green Investment Group Limited ('GIG') has prepared this Green Impact Report (the 'Report') showing various environmental benefits of offshore wind electricity generation projects across the UK, including those projects that are consented, in construction, operational and have been decommissioned; ('UK Offshore Wind Portfolio' or 'Portfolio'). Within this Report, the Portfolio has been divided in line with The Crown Estate's leasing rounds: Round 1, Round 2, Round 3 and Scottish Territorial Waters ('STW') / demonstration projects. The assessment was undertaken using publicly-available data (see Appendix 1). This Report does not contain, nor has any part of the assessment been based on, any commercially confidential data.

The GIR team has forecast the Portfolio's avoided: greenhouse gas ('GHG') emissions; other emissions to air; and fossil fuels consumption, (together, the 'Green Impact') and is pleased to set out its assessments in this Report, as summarised below.

This Report also considers the Portfolio's alignment with the United Nations' Sustainable Development Goals.

The Portfolio scores 'AA' on the GIG Carbon Rating scale with an aggregated average annual forecast of 23.8 Mt CO_2e avoided.

UK Offshore Wind Portfolio Information	
Operational projects	29
Operational capacity (GW)	6.7
Projects under construction	9
Capacity under construction (GW)	5.1
Consented projects in development	11
Consented capacity in development (GW)	10.1



Green Impact Summary: Actual & Forecast Performance

GIG CARBON RATING: AA

AAA
AA
A
B
C
D
E

23.8 Mt CO_2e / avoided (annual ave.)

GHG emissions avoided (carbon dioxide equivalent)	
Forecast remaining lifetime	743,334 kt CO_2e
Forecast average annual	23,815 kt CO_2e / yr
Forecast full deployment annual	32,051 kt CO_2e / yr
Emissions avoided to end 2017	43,422 kt CO_2e
Other emissions to air avoided (oxides of nitrogen)	
Forecast remaining lifetime	624,710 t NO_x
Forecast average annual	19,522 t NO_x / yr
Forecast full deployment annual	26,936 t NO_x / yr
Emissions avoided to end 2017	36,492 t NO_x
Fossil fuels consumption avoided (oil equivalent)	
Forecast remaining lifetime	324,286 kt oe
Forecast average annual	10,134 kt oe / yr
Forecast full deployment annual	13,983 kt oe / yr
Consumption avoided to end 2017	18,943 kt oe

2. Green Impact Forecast

In this Report we use the term 'Green Impact' to refer to the GHG emissions, other emissions to air and fossil fuels consumption avoided by the UK Offshore Wind Portfolio once fully built-out and deployed, as described. Electricity yield generation forecasts are derived from actual performance, with the exception of those projects that have been operating for three years or fewer, whereby the yield generation forecasts have been calculated using the average generation per MW capacity for offshore wind across the UK for the past five years, multiplied by the capacity of the project. Each of the forecasts set out below is based on publicly-available data and is subject to GIG's assessment of Green Impact Forecast Accuracy (as set out on page 4). The forecasts and Green Impact Forecast Accuracy are subject to the methodology, assumptions, limitations set out in Appendices 2 & 3, unless otherwise stated.

Greenhouse gas emissions avoided

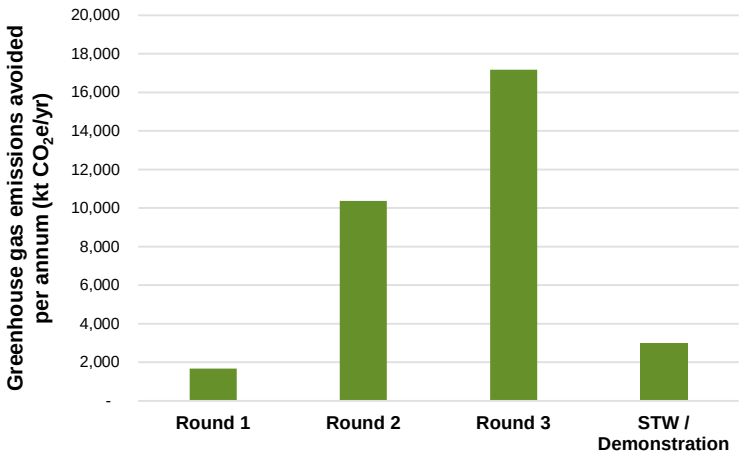
The Portfolio is forecast to avoid emissions of over 32 Mt CO_2e per year

GHG emissions avoided (measured in carbon dioxide equivalent: CO_2e), both actual and forecast, is derived by comparing the emissions associated with each underlying project to a counterfactual (alternative method of energy generation). In this case, the counterfactual is UK marginal grid emissions.

The UK Offshore Wind Portfolio is forecast to avoid an average of 23.8 Mt CO_2e / yr, and is anticipated to peak at almost 32.1 Mt CO_2e / yr once all projects have been deployed.

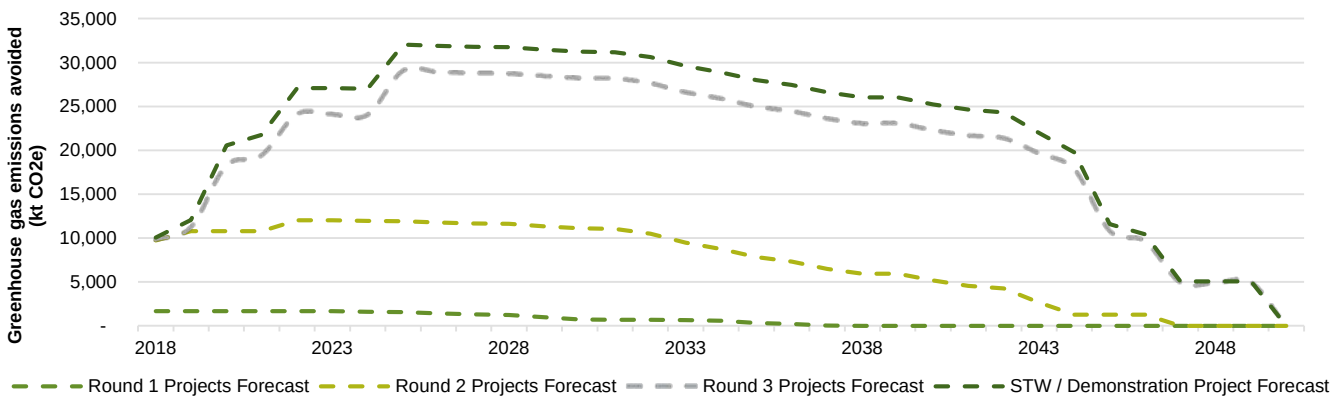
The forecast profiles for each Round are shown in the chart below. This chart demonstrates the step change associated with each Round as more sites become operational, as well as the different years in which the Rounds are forecast to be generating Green Impact.

Round 3 and STW / Demonstration forecasts are estimated based on total consented capacity.



Portfolio GHG emissions avoided (carbon dioxide equivalent)	
Remaining lifetime	743,334 kt CO_2e
Forecast average annual	23,815 kt CO_2e / yr
Full deployment annual	32,051 kt CO_2e / yr

Greenhouse gas emissions avoided: forecast profiles (stacked)



GHG emissions avoided (carbon dioxide equivalent) by round	Remaining lifetime	Forecast average annual	Full deployment annual
Round 1	21,935 kt CO_2e	1,097 kt CO_2e / yr	1,667 kt CO_2e / yr
Round 2	219,203 kt CO_2e	7,559 kt CO_2e / yr	10,364 kt CO_2e / yr
Round 3	429,267 kt CO_2e	13,415 kt CO_2e / yr	17,169 kt CO_2e / yr
STW / Demonstration	72,930 kt CO_2e	2,279 kt CO_2e / yr	2,963 kt CO_2e / yr

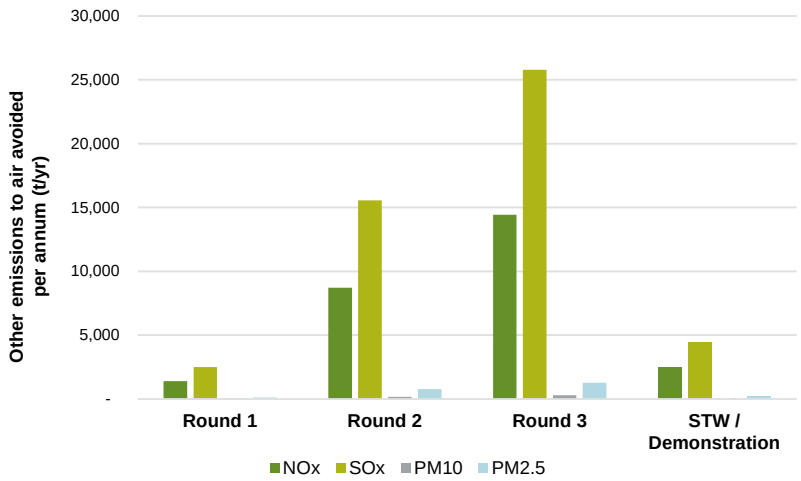
2. Green Impact Forecast

Other emissions to air avoided

The Portfolio is forecast to avoid emissions of almost 27 kt NO_x per year

'Other emissions to air avoided' is a measure of net air pollutant emissions compared to the counterfactual method of energy generation. Quantified air pollutant emissions include oxides of nitrogen (NO_x), oxides of sulphur (SO_x), particulates up to 10 micrometres (μm) in diameter (PM_{10}) and particulates up to 2.5 μm in diameter ($PM_{2.5}$).

The UK Offshore Wind Portfolio is forecast to result in the avoidance of almost 27 kt / yr of NO_x and over 48 kt / yr of SO_x, as well as almost 3 kt / yr of particulate matter once all projects have been deployed.



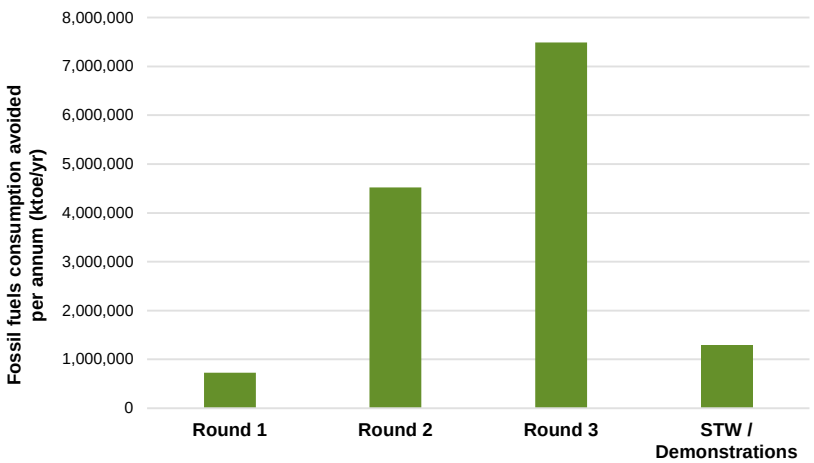
Portfolio emissions to air avoided		
Full deployment annual nitrogen oxides	26,936	t NO_x / yr
Full deployment annual sulphur oxides	48,158	t SO_x / yr
Full deployment annual 10μm particulate matter	563	t PM_{10} / yr
Full deployment annual 2.5μm particulate matter	2,398	t $PM_{2.5}$ / yr

Fossil fuels consumption avoided

The Portfolio is forecast to avoid almost 14 Mt oil equivalent per year

'Fossil fuels consumption avoided' is a measure of the net consumption of coal, oil and gas compared to the counterfactual method of energy generation, and is normalised to kilotonnes of oil equivalent (kt oe) as a proxy measure.

The UK Offshore Wind Portfolio is forecast, on a whole portfolio basis, to result in the avoidance of consumption of almost 14 Mt oil equivalent per year at full deployment.



Portfolio fossil fuels consumption avoided		
Remaining lifetime	324,286	kt oe
Forecast average annual	10,134	kt oe / yr
Full deployment annual	13,983	kt oe / yr

3. Overall Green Impact Forecast Accuracy

GIG has assessed the weighted average Green Impact Forecast Accuracy for UK Offshore Wind Portfolio at Level 3 (Good).

Green Impact Forecast Accuracy is GIG's assessment of the level of confidence that can reasonably be placed on the accuracy of any quantified Green Impact Forecast. It is based on publicly available information (set out in Appendix 1) and on the methodology referred to in Appendix 2.

GIG assesses Green Impact Forecast Accuracy at levels ranging from Level 1 (Low) to Level 5 (Very High), which represent the combined and weighted average of a series of factors, according to GIG's in-house experience of the sensitivity of each element. See Appendix 2 for further detail.

The forecast accuracy for the individual Rounds is shown below.

Level 3 (Good)

Round 1 sites

The Round 1 sites are all fully operational with the exception of Blyth Offshore Windfarm which has been decommissioned. The majority of the Round 1 sites have been operating for over five years. As such forecast performance has been calculated based on past performance and the Green Impact Forecast Accuracy is therefore considered to be Very High. This represents a very high level of confidence that the actual Green Impact will be in line with the forecast going forward.

Level 5 (Very High)

Round 2 sites

The majority of the Round 2 sites are currently operational and, of the remainder, one is under construction whilst another has consent authorised. Of the operational capacity, over half have been in operation for three years or more. As such, while the Green Impact Forecast Accuracy impacted by the development stage and the quality of the data used to calculate the forecast, GIG's confidence in its assessment of the forecast Green Impact is High.

Level 4 (High)

Round 3 sites

The consented Round 3 sites are still in development and as such the forecast is impacted both by the early stage projects (with associated potential for design and capacity change) and the quality of the data used to generate the forecast (which are based on maximum capacity assumptions). Detailed forecast data are not publicly available at this stage. As a result, GIG's confidence in the forecasts for the Round 3 sites is Moderate.

Level 2 (Moderate)

3. Overall Green Impact Forecast Accuracy (cont.)

STW / Demonstration sites

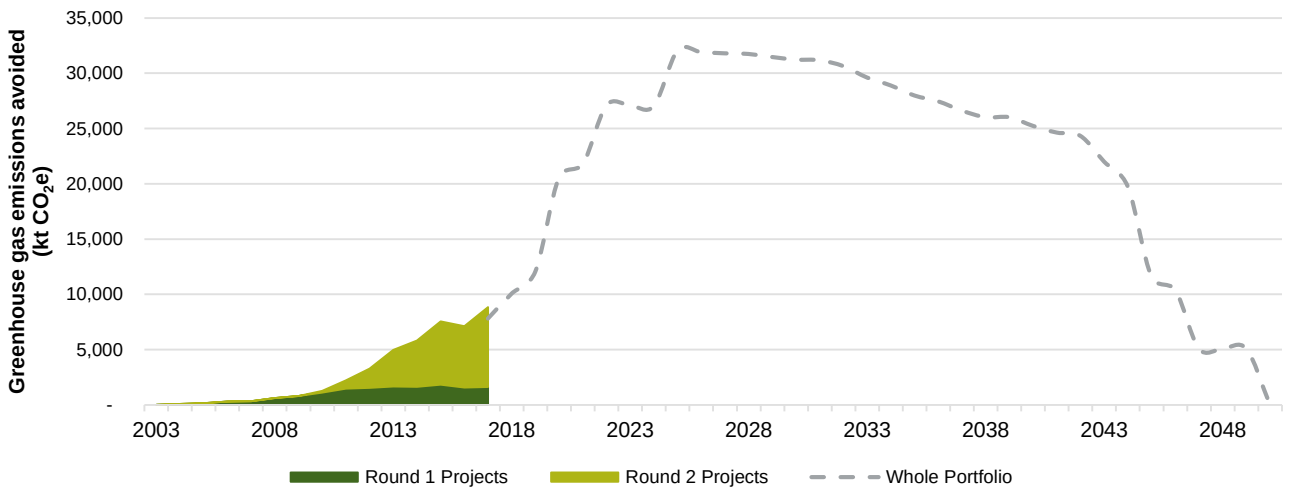
Similar to Round 3 sites, the consented STW and Demonstration sites are still in development and as such the forecast is impacted both by the early stage projects (with associated potential for design and capacity change) and the quality of the data used to generate the forecast (which are based on maximum capacity assumptions). Detailed forecast data are not publicly available at this stage. As a result, GIG's confidence in the forecasts for the STW and Demonstration sites is Moderate.

4. Actual Green Impact Performance

The following section shows the actual Green Impact to the end of 2017 of the operating projects within the UK Offshore Wind Portfolio; namely the GHG emissions, other emissions to air and fossil fuels consumption avoided. The actual GHG emissions avoided and the forecast profiles are shown in the following graph to illustrate previous performance and the expected increase in GHG emissions avoided over the next 30 years.

Offshore wind farms United Kingdom

Over 43 Mt CO_2e cumulatively avoided to end 2017



There has been a steady increase in GHG emissions avoided since 2003 as more capacity has come online. The forecast profile shows that this is expected to increase by more than three times by 2025.

Round 3 and STW / Demonstration sites are not visible on the graph above as there are few projects currently operational. However, together, over the last 10 years the Round 3 and STW / Demonstration sites have cumulatively avoided over 90 kt CO_2e to end 2017.

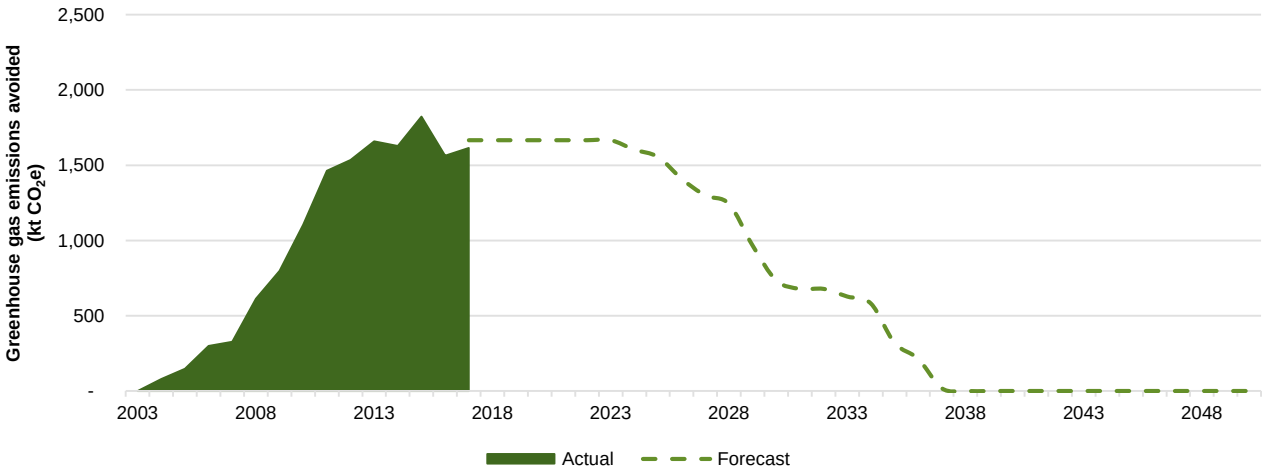
Further information about performance of Round 1 and 2 is provided in the following pages.

Actual annual GHG emissions avoided (kt CO_2e – kilotonnes carbon dioxide equivalent)					
2003	0.4	2008	613	2013	4,979
2004	80	2009	805	2014	5,826
2005	148	2010	1,275	2015	7,552
2006	300	2011	2,228	2016	7,120
2007	327	2012	3,287	2017	8,879

4. Actual Green Impact Performance (cont.)

Round 1 sites

The Round 1 Projects avoided almost 15 Mt CO_2e to end 2017



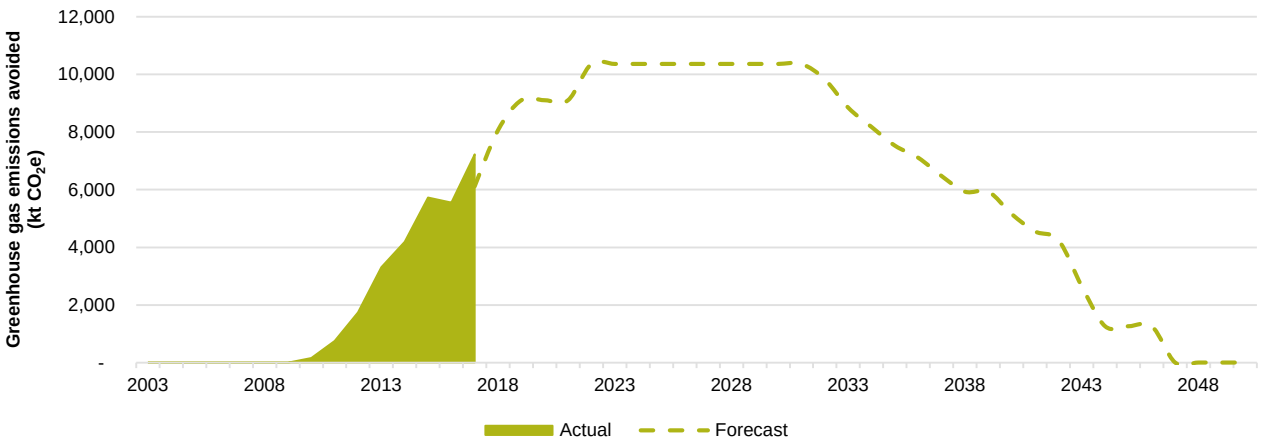
There has been a steady increase in GHG emissions avoided by Round 1 sites since 2004 as more capacity has come online. They are now fully operational (with the exception of one decommissioned project), with each project having an expected design life between 20 and 25 years.

In 2017, they achieved an average capacity factor of 34%.

Actual performance to end 2017		
GHG emissions avoided	14,660	kt CO_2e
NO_X emissions avoided	12,320	kt NO_X
SO_X emission avoided	22,027	kt SO_X
PM_{10} emissions avoided	257	kt PM_{10}
$PM_{2.5}$ emissions avoided	1,097	kt $PM_{2.5}$
Fossil fuels consumption avoided	6,395	kt oe

Round 2 sites

The Round 2 Projects avoided almost 29 Mt CO_2e to end 2017



There has been a steady increase in GHG emissions avoided by Round 2 projects since 2010 as more capacity has come online.

In 2017, they achieved an average capacity factor of 37%. This value is greater than Round 1 as Round 2 projects are constructed with larger turbines and are generally further offshore, resulting in greater wind resource availability.

Actual performance to end 2017		
GHG emissions avoided	28,669	kt CO_2e
NO_X emissions avoided	24,093	kt NO_X
SO_X emission avoided	43,076	kt SO_X
PM_{10} emissions avoided	503	kt PM_{10}
$PM_{2.5}$ emissions avoided	2,145	kt $PM_{2.5}$
Fossil fuels consumption avoided	12,507	kt oe

5. Alignment with the UN Sustainable Development Goals

The United Nations Sustainable Development Goals[1] (SDGs) are a set of 17 goals for sustainable development adopted by the UN in 2015, each with associated targets to be achieved by 2030. The Green Investment Ratings team has considered the performance of the Portfolio against the SDGs and their associated targets and identified those which are most aligned.

The UK offshore wind Portfolio is aligned with the following SDGs:

Reduction of air pollutants through the avoidance of fossil fuels combustion to generate electricity

Generation of clean, renewable electricity

Climate finance investment, supporting the development of renewable infrastructure

Renewable electricity generation, resulting in the avoidance of fossil fuels consumption to generate electricity

Supporting action to tackle climate change through investment into infrastructure which avoids greenhouse gas emissions

SUSTAINABLE DEVELOPMENT GOALS

[1] http://sustainabledevelopment.un.org/sdgs

Appendix 1:

Source data used in the production of the Report

Round 1 Sites

Project Name	Capacity (MW)	Design life (yrs)	Number of turbines	Stage as at September 2018	Operations date	Forecast generation (GWh)
Barrow Offshore Windfarm	90	20	30	Operational	Jun 2006	293.52
Blyth Offshore Windfarm	4	10	2	Decommissioned	Dec 2000	0
Burbo Bank Offshore Windfarm	90	20	25	Operational	Jul 2007	263.25
Gunfleet Sands (1, 2 and Demonstration)	185	25	50	Operational	Jun 2010	585.17
Kentish Flats Ltd - A,C	90	20	30	Operational	Sep 2005	247.95
Lynn and Inner Dowsing Offshore Windfarms	194.2	20	54	Operational	Mar 2009	605.18
North Hoyle Offshore Windfarm - A	60	25	30	Operational	Apr 2004	181.02
Ormonde Windfarm	150	25	30	Operational	Feb 2012	493.72
Rhyl Flats Windfarm	90	25	25	Operational	Dec 2009	287.15
Robin Rigg Offshore Windfarm (East+West)	180	20	60	Operational	Apr 2010	517.34
Scroby Sands Windfarm	60	20	30	Operational	Mar 2004	174.52
Teesside Windfarm	62.1	20	27	Operational	Jun 2013	201.45

Notes
1. All data above are taken from publicly available sources, specifically (a) www.4coffshore.com; (b) Ofgem database; (c) Individual Project websites
2. Forecast generation has been calculated using the following method: (a) Where a Project has been operating for more than three years, forecast generation is calculated as an average of past performance over the last three years; (b) Where a Project is not yet operational, or has been operating for three years or fewer, forecast generation is calculated by multiplying the total capacity of the Project by the average generation per MW capacity of offshore wind farms in the UK over the past five years.

Appendix 1:

Source data used in the production of the Report

Round 2 Sites

Project Name	Capacity (MW)	Design life (yrs)	Number of turbines	Stage as at September 2018	Operations date	Forecast generation (GWh)
Burbo Bank Extension	258	25	32	Operational	May 2017	872.99
Dudgeon Offshore Wind	402	25	67	Operational	Dec 2017	1360.24
Galloper	353	25	56	Operational	Mar 2018	1194.44
Greater Gabbard (GGOWL)	504	25	140	Operational	Sep 2012	1880.55
Gwynt y Mor	576	25	160	Operational	Jun 2015	1664.51
Humber Gateway Offshore Wind Farm	219	25	73	Operational	Jun 2015	741.03
Kentish Flats Extension Wind Farm	49.5	20	15	Operational	Sep 2015	167.49
Lincs Wind Farm	270	20	75	Operational	Aug 2013	1006.72
London Array Offshore Windfarm	630	20	175	Operational	Apr 2013	2311.68
Race Bank	573.3	25	91	Operational	Feb 2018	1939.86
Sheringham Shoal Wind Farm	317	25	88	Operational	Oct 2012	1116.62
Thanet Offshore Wind Farm	300	40	100	Operational	Sep 2010	869.42
Triton Knoll	860	25	90	Consent Authorised	Jan 2022*	2909.96
Walney Extension	660	25	90	Operational	Sep 2018	2233.23
Walney Offshore Wind Phase I + Phase II	368	20	102	Operational	Feb 2012	1354.16
West of Duddon Sands Offshore Wind Farm	388.8	20	108	Operational	Oct 2014	1533.24
Westermost Rough	210	25	35	Operational	Jul 2015	778.47

* Consented projects have an assumed operations date based on best available knowledge. It is anticipated that not all of these projects are likely to be built due to CfD availability.

Notes

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2. Forecast generation has been calculated using the following method: (a) Where a Project has been operating for more than three years, forecast generation is calculated as an average of past performance over the last three years; (b) Where a Project is not yet operational, or has been operating for three years or fewer, forecast generation is calculated by multiplying the total capacity of the Project by the average generation per MW capacity of offshore wind farms in the UK over the past five years.

Appendix 1:

Source data used in the production of the Report

Round 3 Sites

Project Name	Capacity (MW)	Design life (yrs)	Number of turbines	Stage as at September 2018	Operations date	Forecast generation (GWh)
Dogger Bank- Creyke Beck A	1200	25	200	Consent Authorised	2020*	4060.41
Dogger Bank- Creyke Beck B	1200	25	200	Consent Authorised	2020*	4060.41
Dogger Bank- Teesside A	1200	25	200	Consent Authorised	2020*	4060.41
East Anglia One	714	25	102	Construction	Jun 2020	2415.94
East Anglia Three	1200	25	172	Consent Authorised	2025*	4060.41
Hornsea Project One	1218	25	174	Construction	Jun 2020	4121.32
Hornsea Project Two	1386	25	165	Construction	Jan 2022	4689.77
Moray East	950	25	100	Consent Authorised	2022*	3214.49
Rampion	400.2	25	116	In Commissioning	Sep 2018	1354.15
Seagreen Alpha and Bravo	1050	25	150	Consent Authorised	2025*	3552.86
Sofia (Teeside Wind Farm B)	1200	25	200	Consent Authorised	2025*	4060.41

* Consented projects have an assumed operations date based on best available knowledge. It is anticipated that not all of these projects are likely to be built due to CfD availability.

Notes

1. All data above are taken from publicly available sources, specifically (a) www.4coffshore.com; (b) Ofgem database; (c) Individual Project websites
2. Forecast generation has been calculated using the following method: (a) Where a Project has been operating for more than three years, forecast generation is calculated as an average of past performance over the last three years; (b) Where a Project is not yet operational, or has been operating for three years or fewer, forecast generation is calculated by multiplying the total capacity of the Project by the average generation per MW capacity of offshore wind farms in the UK over the past five years.

Appendix 1:

Source data used in the production of the Report

STW / Demonstration Sites

Project Name	Capacity (MW)	Design life (yrs)	Number of turbines	Stage as at September 2018	Operations date	Forecast generation (GWh)
Aberdeen Offshore Wind Farm (EOWDC)	93.2	20	11	In Commissioning	Aug 2018	315.36
Beatrice Offshore Windfarm (BOWL)	10	5	84	Decommissioned	Sep 2009	0.00
Blyth Offshore Demonstrator Project	41.5	22	5	Operational	Jun 2018	140.42
Dounreay Tri	10	25	2	Construction	Jan 2020	33.84
ForthWind Offshore Wind Demonstration Project Phase 1	12	25	2	Consent Authorised	2025*	40.60
Hywind Scotland Pilot Park	30	20	5	Operational	Oct 2017	101.51
Inch Cape	784	25	72	Consent Authorised	2022*	2652.80
Kincardine Offshore Windfarm	50	25	7	Construction	Jan 2020	169.18
Levenmouth Demonstration	7	25	1	Operational	2014	23.69
Neart na Gaoithe	448	25	54	Consent Authorised	2022*	1515.89
Beatrice Offshore Windfarm (BOWL)	588	25	84	Construction	Jun 2019	1989.60

* Consented projects have an assumed operations date based on best available knowledge. It is anticipated that not all of these projects are likely to be built due to CfD availability.

Notes

1. All data above are taken from publicly available sources, specifically (a) www.4coffshore.com; (b) Ofgem database; (c) Individual Project websites
2. Forecast generation has been calculated using the following method: (a) Where a Project has been operating for more than three years, forecast generation is calculated as an average of past performance over the last three years; (b) Where a Project is not yet operational, or has been operating for three years or fewer, forecast generation is calculated by multiplying the total capacity of the Project by the average generation per MW capacity of offshore wind farms in the UK over the past five years.

Appendix 2

Terms and Conditions: Terminology and Methodology

Terminology

Green Impact

The Green Impact metrics covered by this Report are identified in the header and executive summary. "Green Impact" is a collective term referring to the environmental benefits which have been calculated in accordance with GIG's methodology to be, or to be reasonably likely to be, delivered by the project(s) to which this Report refers. The collective term can include defined metrics such as tonnes carbon dioxide equivalent avoided (t CO_2e), tonnes oil equivalent avoided (toe), and tonnes (t) of other air pollutant emissions avoided.

Green Impact Forecast Accuracy

"Green Impact Forecast Accuracy" is an expression of the level of confidence that, in the opinion of GIG, can reasonably be placed on the accuracy of any quantified Green Impact forecast. This assessment of forecast accuracy is described in levels as follows: Level 1 (Low), Level 2 (Moderate), Level 3 (Good), Level 4 (High), and Level 5 (Very High).

Forecast Average Annual

Forecast average annual refers to the annual average green impact over the remaining lifetime of project/ portfolio until the expected decommissioning of the project/final project within the portfolio

Methodology v 1.1

The Green Impact and Green Impact Forecast Accuracy assessments presented in this Report are based on GIG's approach to assessing Green Impact using the methodologies set out within its proprietary green investment principles, policies and the associated processes of the Green Investment Handbook[1]. The Green Impact assessment has applied proprietary modelling techniques and comparative data developed and owned by GIG, or by third party owners and made available under licence to GIG.

Green Impact calculation

GIG's initial calculation of the Green Impact of each project is produced by comparing relevant information and data derived from that project against relevant counterfactual (or baseline) data for the assumed environmental impacts that would occur if the project did not take place, based on GIG's proprietary reference sources or provided to GIG by relevant third parties or obtained from publicly available sources. The resultant estimated Green Impact is then subject to further qualitative evaluation before production of GIG's formal Green Impact Report.

For grid-connected projects that generate electricity, the counterfactual is assumed to be marginal electricity generated from the national grid in that country, which includes resources consumed to supply grid electricity. GIG's methodology calculates the net Green Impact of the project by comparing its likely emissions to those of a marginal grid electricity mix, using the methodology set out in the International Financial Institutions (IFI) approach to GHG accounting for renewable energy projects[2] and the IFI approach to GHG accounting for energy efficiency projects[3].

GIG's methodology calculates results for likely Green Impact on an annual and lifetime basis.

Exclusions

The counterfactual of marginal grid electricity does not include the total quantifiable lifecycle environmental burdens (e.g. resources consumed during construction, or indirect emissions during operations such as those from associated transport vehicles) associated with energy generation. Therefore, to produce a valid comparison, the calculation of Green Impact for the project(s) assessed in this Report is based solely on the operational phase of the relevant project(s), and does not include a full lifecycle assessment of the project(s) unless specifically stated otherwise. This approach is aligned with the Greenhouse Gas Project Protocol[4].GIG's assessment does not include a review of any underlying project's environmental and/or social, permitting, licencing or other compliance status.

Green Impact Forecast Accuracy

Green Impact Forecast Accuracy is determined from a number of project parameters that include the project technology, stage of project development, and country in which the project is located, together with GIG's opinion of the input data quality. These parameters have been assigned values that represent the degree to which they affect the accuracy of the forecast Green Impact, and are used to produce Forecast Accuracy scores for three elements: Data quality, Technology & development stage, and Country governance[5]. The Forecast Accuracy scores for the three elements are weighted according to GIG's in-house experience of the sensitivity of each element and combined to derive an overall level of Green Impact Forecast Accuracy

Carbon Rating

Our Carbon Rating is a measure of a project's lifecycle greenhouse gas emissions compared to the emissions of the counterfactual. Projects with the lowest lifecycle emissions relative to the counterfactual would score the highest ratings from AAA to B. Projects with lifecycle emissions similar to the counterfactual would score a C, and projects with greater emissions would score a D or E. The emissions of the counterfactual are derived from the IFI approaches to greenhouse gas accounting – please see above for details. Where we do not have project-specific information on lifecycle emissions, we use the median harmonised values from the US National Renewable Energy Laboratory's Lifecycle Assessment Harmonization[6]

[1] www.greeninvestmentgroup.com/green-impact
[2] http://documents.worldbank.org/curated/en/2015/12/25514886/ifi-approach-ghg-accounting-renewable-energy-projects
[3] http://documents.worldbank.org/curated/en/2015/12/25514884/ifi-approach-ghg-accounting-energy-efficiency-projects
[4] www.ghgprotocol.org/standards/project-protocol
[5] Country governance scores are determined from datasets of indicators from the World Bank, Transparency International and United Nations University Institute for Environment and Human Security
[6] https://www.nrel.gov/analysis/life-cycle-assessment.html

Appendix 3

Terms and Conditions: Assumptions, Limitations and other terms

Disclaimer

Green Investment Group Limited is not an authorised deposit-taking institution for the purposes of the Banking Act 1959 (Cth)1, and Green Investment Group Limited's obligations do not represent deposits or other liabilities of Macquarie Bank Limited ABN 46 008 583 542. Macquarie Bank Limited does not guarantee or otherwise provide assurance in respect of the obligations of Green Investment Group Limited.

Scope and distribution of this document

UK Green Investment Bank plc ("GIG") has prepared this document (the "Report") for the exclusive use of the person with whom GIG has contracted to produce it (together with its subsidiaries and affiliates (the "Recipient")) in connection with the project or projects identified on page 1.

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Appendix 3

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Reference data

In preparing this Report, GIG has relied upon various sources of data and information obtained through public information sources, the content of which no GIG Party has verified or controls.

GIG calculates Green Impact using reference data obtained from, among others, the Ecoinvent life cycle inventory datasets for the calculation of environmental impacts. Green Impact is also calculated based on data supplied by the International Energy Agency (IEA), specifically from the 2015 editions of the World Energy Statistics and Balances dataset and the CO_2 Emissions from Fuel Combustion dataset.

Any limitations and caveats that are applicable to the Ecoinvent and IEA datasets, as published on their websites, are also applicable to the results presented in this Report.

GIG's method is designed to work with a limited number of key inputs and to create results for over 200 different countries and makes some simplifying assumptions in order to achieve this degree of flexibility.

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Appendix 4

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Appendix 5

Deloitte LLP Independent Assurance Report to Green Investment Group Limited on the assertions contained within the 'Green Impact Report: Offshore Wind UK'.

We have been engaged by the Directors of the UK Green Investment Group Limited ("GIG") to conduct a limited assurance engagement relating to the assertions contained within the 'Green Impact Report: Offshore Wind UK'.

Our unqualified conclusion

Based on our work as described in this report, nothing has come to our attention that causes us to believe that the assured assertions are materially misstated.

Respective responsibilities of the directors and assurance provider

The Directors are responsible for preparing the 'Green Impact Report: Offshore Wind UK'.

The data has been prepared on the basis of the methodology set out in Appendix 2 of the 'Green Impact Report: Offshore Wind UK'.

Our responsibility is to express a conclusion on the selected assertions based on our procedures. We conducted our engagement in accordance with International Standard on Assurance Engagements 3000 (Revised) *Assurance Engagements Other than Audits or Reviews of Historical Financial Information* ("ISAE3000 (Revised)"), issued by the International Auditing and Assurance Standards Board, in order to state whether anything had come to our attention that causes us to believe that the Assured Data have not been prepared, in all material respects, in accordance with the applicable criteria.

Our engagement provides limited assurance as defined in ISAE3000 (Revised). The evidence gathering procedures for a limited assurance engagement are more limited than for a reasonable assurance engagement, and therefore less assurance is obtained than in a reasonable assurance engagement.

Procedures

Our procedures consisted of:

Selecting a sample of quantitative and qualitative assertions ("Assertions") made throughout the Offshore Wind Report and requesting supporting evidence associated with the assertions.

Reading the supporting evidence and assessing:

- Applicability of the supporting evidence to assertion
- Original context of the supporting evidence as compared to the context of the assertion
- Where sourced externally, whether the external data source is a commonly used and reputable source of data
- Where sourced internally, whether the internal data has been taken from the same systems used to compile GIG's Green Impact Statements.

Our Procedures did not include:

Procedures to test the robustness of the supporting evidence underlying the sampled Assertions

Interviewing personnel responsible for the preparation of the report to understand the report management process

Evaluation of the internal data management and reporting system, nor the associated processes and controls.

Independence

We performed the engagement in accordance with Deloitte's independence policies, which cover all of the requirements of the International Federation of Accountants' Code of Ethics and in some areas are more restrictive. The firm applies the International Standard on Quality Control 1 and accordingly maintains a comprehensive system of quality control including documented policies and procedures regarding compliance with ethical requirements, professional standards and applicable legal and regulatory requirements.

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