Contents

Abbreviations and Acronymns

DECC	Department of Energy and Climate Change
ESS	Energy Security Strategy
EU	European Union
FTE	Full Time Equivalent
GDP	Gross Domestic Product
GHG	Greenhouse Gas
Gt	Gigatonnes
GVA	Gross Value Added
GW	Gigawatt
IEA	International Energy Agency
IPCC	Intergovernmental Panel on Climate Change
OECD	Organisation for Economic Co-operation and Development
UK	United Kingdom

8 Benefits of the Project

8.1 Introduction

1 This chapter describes the benefits which will occur through delivery of the Project. In broad terms, these benefits are:

- Contribution to mitigating the effects of climate change;
- Contribution to, and security of, domestic energy supplies and to a sustainable energy mix within Scotland and the United Kingdom (UK); and
- Economic benefits of the Project.

2 This chapter is structured around these key benefits and is directly supported by the following chapters and accompanying document:

- *Chapter 2: Policy and Legal Background*;
- *Chapter 22: Socio-economics and Tourism*; and
- *Offshore Planning and Policy Statement*.

8.2 Climate Change

8.2.1 Background and Context

3 Climate change can be defined as "*…a change of climate, which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods."*(United Nations Framework Convention on Climate Change, 1992). It is widely accepted in the scientific community that *"most of the observed increase in global average temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic greenhouse-gas* (GHG) *concentrations"* (Intergovernmental Panel on Climate Change (IPCC), 2007). The increase in global air and ocean temperatures has led to secondary effects, such as decreasing snow and ice cover, leading to increased sea levels and thus coastal flooding events. Global climate change could give rise to adverse economic, social and ecological impacts.

4 Global surface temperatures rose by 0.74°C between 1906 and 2005 and the World Meteorological Organization say the current 2012 global average temperature is 14.45°C, which is 0.45 ± 0.10°C above the 1961-1990 average (IPCC, 2007). The increase of GHG emissions from human activities has increased by 70 per cent in the period from 1970 to 2004. Within this same time period the emission of carbon dioxide (CO_2) increased by 80 per cent (IPCC, 2007). In 2011 it was concluded that CO_2 emission levels for the group of countries participating in the Kyoto Protocol were 14.7 per cent below their 1990 level (Organisation for Economic Co-operation and Development/International Energy Agency (OECD/IEA, 2011) and global CO_2 emissions decreased by one per cent or 0.5 gigatonnes (Gt) carbon dioxide between 2008 and 2009 due to the slowdown in economic activity

(OECD/IEA, 2011). The combined share of electricity generation, heat generation and transportation represented nearly two-thirds of global emissions in 2009; with generation of electricity and heat responsible for 41 per cent of CO_2 emissions (International Energy Agency (IEA), 2011). It should be noted, however, that all indications predict emissions levels will rebound when economic conditions pick up. This would mean that the world CO_2 emissions from fuel combustion will continue to grow if unabated to a predicted 35.4 Gt CO_2 by 2035 (IEA, 2010). It has been predicted that if the global population continues to grow at the projected levels, with a corresponding continued increase in energy demand and reliance on fossil fuels, global average surface temperatures could rise by 2.4 - 6.4°C by 2099 relative to 1980 – 1999 temperatures (IPCC, 2007).

5 Over the past 20 years[1] the issue of climate change has been growing in importance at a global level and countries throughout the world have been active in discussions regarding the associated effects and their importance. There have been several international agreements (the most notable being the Kyoto Protocol, adopted in 1997 (United Nations, 2008)) and European and domestic legislation and policies put in place, which seek to help address climate change.

6 The most recent United Nations Climate Change Conference in Cancun, Mexico, in 2010, saw signatory countries, including the UK, commit to a number of comprehensive and far-reaching agreements. These included a commitment that future global warming should be limited to below 2.0°C relative to the pre-industrial level. This commitment recognises that climate change represents an urgent and potentially irreversible threat to human societies and the planet, which needs to be urgently addressed by all parties. There is also a growing realisation that switching to low carbon energy technologies and improving energy efficiency is a vital component of reducing CO_2 emissions and combatting climate change.

8.2.2 Mitigating the Effects of Climate Change

7 In order to combat climate change the European Union (EU), UK and Scotland have introduced legislation and binding targets for reductions in carbon emissions and corresponding renewable electricity power generation targets. *Chapter 2* provides a more comprehensive overview of these targets and policies within a wider context. The targets for reduction are summarised below.

8 The EU targets:

- GHG emissions 20 per cent lower than 1990 levels by 2020 (European Commission, 2012);
- 20 per cent of energy from renewables by 2020 (European Commission, 2012); and
- 20 per cent increase in energy efficiency/cut in energy consumption by 2020 (European Commission, 2012).

[1] In 1992, the first international treaty on Climate Change 'The United Nations Framework Convention on Climate Change (UNFCCC) was developed at the United Nations Conference on Environment and Development.

9 The UK targets:

- 80 per cent reduction in GHG emissions by 2050 (Department of Energy and Climate Change (DECC), 2013); and
- 30 per cent electricity, 12 per cent of heat and 10 per cent of transport energy to be generated from renewables by 2020 (Her Majesty's Government, 2009).

10 Scotland's targets:

- 80 per cent reduction in GHG emissions by 2050 and an interim 42 per cent reduction target by 2020 (*Climate Change (Scotland) Act 2009*); and
- The equivalent of 100 per cent of electricity consumption generated by renewables by 2020 (Scottish Government, 2012a).

UK and Scottish Government Commitment to Renewable Energy Development

11 The UK target under the *European Renewable Energy Directive* is to generate 15 per cent of energy from renewable sources by 2020. This target is acknowledged in the *UK Renewable Energy Strategy* (see *Section 2.4.4*) which identifies that 30 per cent of UK electricity should come from renewable sources by 2020 with more than two thirds of that figure from onshore and offshore wind capacity. In Scotland a more challenging domestic policy commitment has been set by the Scottish Government (2011a) in their *2020 Routemap for Renewable Energy in Scotland*. This document incorporates the Scottish Government target to meet an equivalent of 100 per cent demand for electricity from renewable energy by 2020.

Delivery in Scotland

12 The Scottish Government's renewable energy targets are higher than the UK (see above). Statistics published in Scotland for March 2012 indicate that the amount of renewable electricity generated in 2011 rose 45 per cent from 2010 levels to 13,750 Gigawatt (GW) hours. Assuming gross consumption in 2011 was similar to 2010 that means around 35 per cent of Scotland's electricity needs came from renewables in 2011, beating the Scottish Government's target of 31 per cent (Scottish Government, 2012b).

Carbon Emissions Offset

13 Scottish Renewables has indicated that renewable wind and hydro projects have already displaced 8.36 million (Hansard HC, 2012) tonnes of CO_2 emissions which are equivalent to 15 per cent of the country's total carbon emissions. Consequently the Scottish Government announced, in October 2012, that a refreshed Renewables Routemap interim target had been set, whereby the equivalent of 50 per cent of Scotland's electricity demand will be met by renewable sources by 2015 (Scottish Government, 2012b).

8.2.3 Project Contribution

14 Offshore wind farms are a critical element of ensuring that the EU, UK and Scottish carbon emissions targets are met as part of a wider international climate change reduction commitment.

15 The electrical energy generated through the Project will offset GHG emissions by displacing fossil fuel based generation. A calculation has been carried out of the amount of CO_2 that will be offset from the Project in comparison with other forms of generation (*Appendix 8A: Carbon Balance Review*). The expected annual CO_2 emission savings from the Inch Cape Offshore Wind Farm could account for the equivalent of 17.8 per cent (over gas-fired generation) or 26.8 per cent (over fossil fuel mix generation) or 40.9 per cent (over coal-fired generation) of the total CO_2 emissions estimated for Scotland in 2010, assuming that gas-fired, coal-fired or fossil fuel mix generation are replaced alone.

16 Based on published estimates of CO_2 emission costs that would arise from construction, and operation of the Project, the time taken to payback the CO_2 emission costs of the Project through offsetting emissions from a fossil fuel mixed generation would be slightly less than 12 months (see *Appendix 8A, Section 8A.4.2*).

8.3 Energy Security

8.3.1 Background and Context

17 The aim of energy security is to ensure domestic consumers can meet their energy requirements at prices that are not excessively volatile as a result of a heavy reliance on imported fuel from potentially unstable sources. The UK has historically experienced strong energy security through a diverse energy mix and extensive North Sea resources. However, the UK energy system is changing; older infrastructure is being shut down, North Sea fossil fuel reserves are in decline, imports of gas have been rising steadily and the energy system is adapting to meet low-carbon objectives. Imported energy is often more expensive than domestic generation and has been subject to restricted supply and price volatility. Energy security of supply is therefore recognised as a key consideration in the development of the current UK energy policy.

8.3.2 Securing Domestic Energy Supplies

18 The UK Government's first Energy Security Strategy (ESS) (DECC, 2012) sets out an assessment of UK energy security, the challenges and risks to energy security and the UK Government's policy response. The report highlights three main challenges to the UK's energy security as follows:

- Around one fifth of UK power stations are due to close this decade, due to end of life and pollution control issues;
- The UK energy system needs to adapt to meet ambitious and legally binding carbon emission reduction targets; and

- Declining fossil fuel resources in the UK continental shelf are currently making the UK increasingly dependent on imports at a time of rising global demand and increased resource competition.

19 Within the ESS the UK Government is committed to decarbonising the UK's energy supplies through Electricity Market Reform in order to help low carbon technologies compete for market share on price with the fossil fuel industries. The UK's renewable energy strategy will also drive the deployment of renewable energy generation within the UK and help the renewables industry become more competitive when compared with traditional fuel sources (DECC, 2012).

20 The potential for offshore wind energy around the UK, as a means of securing sustainable energy supplies, is acknowledged. *The Offshore Valuation- A valuation of the UK's offshore renewable energy resource* (The Offshore Valuation Group, 2010) report, the first full economic valuation of Britain's offshore renewable resource, found that using just one third of the UK's wind, wave and tidal resource could unlock the electricity equivalent of one billion barrels of oil a year (matching annual North Sea oil and gas production) and give CO_2 reductions of 1.1 billion tonnes by 2050. There is an estimated 206 GW of offshore wind, wave and tidal resource in Scottish Waters (The Offshore Valuation Group, 2010).

8.3.3 Project Contribution

21 The Project is expected to transmit around 1,050 MW (see *Section 1.3*) which would represent an increase of 22 per cent over the latest estimate (Scottish Renewables, 2011) of installed renewable electricity capacity in Scotland (and an 8.5 per cent increase for the UK). It also represents 0.5 per cent of the Scottish Government's estimated total offshore renewable electricity potential (of 206 GW, Scottish Government, 2011b). The proposals are expected to generate in the order of 3,000 GW hours of electricity per annum which is approximately equivalent to 9.0 per cent of current (2010) Scottish annual electricity consumption (Scottish Government, 2012c). This represents a significant contribution at both Scottish and UK levels to domestic electricity generation and therefore to long term energy security.

8.4 Economic Benefits

8.4.1 Background and Context

22 The development of the Project will lead to economic benefits, locally, regionally and nationally. As outlined in the following sections, these economic benefits include:

- increased investment in infrastructure;
- increased income, employment and skills; and
- reduced negative economic impacts of climate change.

8.4.2 Delivering Economic Benefits

Investment in Infrastructure and Development

23 In order for Europe, the UK and Scotland to benefit economically from the significant scale of the planned offshore wind developments, the appropriate infrastructure must be in place to attract, locate and retain development within these areas. Investment in specific projects and associated infrastructure will bring direct benefits as well as indirect and induced benefits through the supply chain.

24 In order to attract and retain project investment, suitable industrial infrastructure including ports and construction facilities will be required. Anticipatory investment to build a supply chain of sufficient scale is crucial, which could come in the form of creation of physical manufacturing and operation and maintenance bases as well as diversification of products and services. Once established in the offshore wind industry, businesses will have the opportunity to gain from domestic and export markets.

25 Due to the jobs created as a result of offshore wind development in rural and urban communities', improvements to facilities and training will be necessary. This infrastructure is to be delivered through European, UK and Scottish Governments, alongside the private sector. These investments are intended to enable potential economic benefits to be realised.

26 As offshore wind related businesses develop in the UK and Scotland, more investment, businesses and labour will be attracted into the industry and the UK. This will also provide the opportunity to retain skills and experience, leading to increased retention of income and therefore economic benefit.

Income, Employment and Skills

27 The offshore wind industry is attracting significant project investment and income to the EU, UK and Scotland, and in doing so is creating a substantial number of direct and indirect jobs.

28 Expenditures from offshore wind projects would be retained within the supply chain, given infrastructure upgrade and supply chain capacity expansion. This income would then filter through the supply chain tiers and into related industries. A variety of industries would benefit from this effect. As an indication of the scale of this income, it has been estimated that the cumulative Gross Value Added (GVA) income that could potentially be created in Scotland is £7.1 billion by 2020 (Scottish Government, 2010).

29 The offshore wind industry will create employment, which will lead to increased salaries and indirect benefits in the area where jobs are located. Jobs created will range from short-term construction jobs to long-term operation and maintenance jobs, and as the offshore wind industry grows the nature of the construction and decommissioning jobs will become sustainable and long-term as workers can move from one project to the next within the industry. There will also be a variety of job roles created within the supply chain.

30 In the UK it is estimated that the industry currently employs around 4,000 full time equivalent (FTE) (Renewable UK, 2013), and could create up to 40,000 direct FTE jobs by 2020 and almost 70,000 FTE jobs overall if indirect and induced jobs are included (UK Commission for Employment and Skills, 2011). The latest statistics show that currently in the EU there are 35,000 FTE jobs, and it is estimated that there will be 170,000 FTE jobs by 2020 and 300,000 FTE jobs by 2030 within the European offshore wind industry (European Wind Energy Agency, 2013).

31 It is estimated that the offshore wind industry in Scotland currently employs 943 people (Scottish Renewables, 2012) and that this has the potential to provide 28,000 direct and an additional 20,000 indirect and induced FTE jobs by 2020 (Scottish Government, 2010).

Reduction of Economic Impacts of Climate change

32 In addition to the environmental and social implications of climate change, it is recognised that the predicted changes could have a wide and significant negative global economic impact.

33 The Stern Review, a report published in 2006, on economics of climate change, estimates that if there is no action, the overall costs and risks of climate change will be equivalent to losing at least five per cent of global Gross Domestic Product (GDP) each year (Stern, N., 2006). This figure could rise to 20 per cent of GDP or more if a wider range of risks and impacts are taken into account. In contrast, the costs of action to reduce GHG emissions to avoid the worst impacts of climate change can be limited to around one per cent of global GDP each year. It has been indicated that the benefits over time of actions to shift the world onto a low-carbon path could be in the order of $2.5 trillion each year (Stern, N., 2006).

34 Offshore wind farms can play a key role in reducing the level of GHG emissions thus reducing the associated negative economic impacts that may arise from the impacts of climate change, such as the costs of flood damage, crop damage, pressure on food production and species extinction.

8.4.3 Project Contribution

35 At a Scottish level the Project would create between £154 million and £507 million GVA in the construction phase, between £15.6 million per annum and £22.4 million GVA per annum in the operation and maintenance phase. Full details of this are outlined in *Chapter 22* (see *Section 22.7.3* and *Section 22.13.2*).

36 The Project will support this by creating employment during all phases of the Project in the east of Scotland, Scotland and the UK.

37 Employment creation within the Economic Study Area is estimated to be as follows, with full details of this outlined in *Chapter 22*:

- Construction Phase – Creation of between 457 (base case) and 1,384 (high case) direct, indirect and induced FTE jobs (see *Section 22.7.2*);

- Operation and Maintenance Phase – Creation of between 117 and 169 direct, indirect and induced FTE jobs (see *Section 22.7.3*); and
- Decommissioning Phase – Creation of 200 direct, indirect and induced FTE jobs (see *Section 22.7.4*).

38 Employment creation at a Scottish level during the construction phase is estimated to be between 494 (base case) and 1,629 (high case) and at a UK level between 1,157 (base case) and 2,964 (high case) (see Table 22.10).

39 As well as jobs being created, there is likely to be a general up-skilling of the workforce and transfer of skills from UK's long-established oil and gas industry expertise. The public and private sector are currently working together to find out what roles are required for offshore wind development, whether the skills are available within the local, regional and national area and what training and up-skilling is likely to be required. Training courses are being developed across the UK, with higher and further education providers working together to provide a coordinated approach e.g. the Energy Technology Partnership and the Scotland's College Energy Skills Partnership working together to provide training for the offshore renewables industry in Scotland. It is anticipated that the Project will support and utilise the skills and training provided.

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