Contents

Abbreviations and Acronyms

CO_2 eq	Equivalent carbon dioxide
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
UK	United Kingdom

8 Benefits of the Development

8.1 Introduction

1 This chapter describes the benefits which are likely to occur through delivery of the Development. In broad terms, these benefits include:

- 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 Development.

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

- *Chapter 2: Policy and Legislative Context*;
- *Chapter 6*: *Site Selection and Alternatives*;
- *Chapter 16: Socio-Economics*; and
- *Offshore Planning and Policy Statement*.

3 The current expected Development capacity, based on the existing grid connection agreement, will be around 700 MW and thus as an example the potential economic benefits of the Development have been calculated on this number. Should the final overall capacity be more than 700 MW there will of course be greater economic benefits associated with this. It should be noted that for the purposes of the socio-economic impact assessment (see *Chapter 16*) a worst-case scenario of 560 MW has been used (e.g. the minimum benefit associated with the design envelope being applied for).

4 For reference, detail is provided on the efficiency changes in the offshore wind industry since the Inch Cape 2014 Consent in *Chapter 6*.

8.2 Climate Change

8.2.1 Background and Context

5 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.

6 Global surface temperatures rose by 0.85°C between 1880 and 2012 and the period from 1983- 2012 was very likely the warmest 30 year period of the last 800 years. (IPCC, 2014). Annual GHG emissions grew on average by 2.2 per cent per year from 1970 – 2000 and the GHG missions from 2000 – 2010 were the highest in human history and reached 49 (± 4.5) Gigatonnes (Gt) equivalent carbon dioxide (CO_2 eq) per year in 2010 (IPCC).

7 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 is anticipated that 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).

8 Over the past few decades[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, and European and domestic legislation and policies put in place which seek to help address climate change. Full details of these can be found in *Section 2.4* of *Chapter 2*.

8.2.2 Mitigating the Effects of Climate Change

9 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 comprehensive overview of these targets and policies within a wider context. The Scottish Government's 2030 targets for reduction as published in the *Scottish Energy Strategy: The Future of Energy in Scotland (2017)* are shown below:

- The equivalent of 50 per cent of the energy for Scotland's heat, transport and electricity consumption to be supplied from renewable sources; and
- An increase by 30 per cent in the productivity of energy use across the Scottish economy.

UK and Scottish Government Commitment to Renewable Energy Development

10 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* 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

[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.

been set by the Scottish Government (2015) in their *2020 Routemap for Renewable Energy in Scotland*. Full details of the Routemap can be found in *Section 2.5.2*.

Carbon Emissions Offset

11 The Department for Business, Energy and Industrial Strategy (BEIS) has indicated that renewable electricity displaced 13.4 million tonnes of CO_2 emissions in 2015 (House of Commons, 2016). Consequently, in June 2017, the Scottish Government announced its intention to adopt a more ambitious 2050 target for a reduction in GHG of 90 per cent, further decarbonising the electricity system (Scottish Government, 2017a).

8.2.3 Inch Cape Wind Farm's Contribution to Meeting Climate Change Targets

12 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.

13 The electrical energy generated through the Development will offset GHG emissions by displacing fossil fuel based generation.

14 A calculation has been carried out of the amount of CO_2 that will be offset from the Development in comparison with other forms of generation (*Appendix 8A: Carbon Balance Review*). The expected annual CO_2 emission savings from the Inch Cape Wind Farm (based on 700 MW capacity) could account for the equivalent of 8.8 per cent (over gas-fired generation) or 13 per cent (over fossil fuel mix generation) or 21 per cent (over coal-fired generation) of the total CO_2 emissions estimated for Scotland in 2015, assuming that gas-fired, coal-fired or fossil fuel mix generation are replaced alone.

15 Based on published estimates of CO_2 emission costs that would arise from construction, and operation of the Development, the time taken to payback the CO_2 emission costs of the Development through offsetting emissions from a fossil fuel mixed generation would be around 14 months (see *Appendix 8A, Section 8A.4.2*).

8.3 Energy Security

8.3.1 Background and Context

16 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 markets. 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

17 The *UK Government's Energy Security Strategy* (ESS) (Department of Energy and Climate Change (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 highlighted 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.

18 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.

19 This is also reflected in the Scottish Government's 2050 vision for energy in Scotland, which has been built around six priorities. Of which energy security and renewable and low carbon solutions are noted as a priority (Scottish Government, 2017).

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 Gigawatt (GW) of offshore wind, wave and tidal resource in Scottish Waters (The Offshore Valuation Group, 2010).

8.3.3 Inch Cape Wind Farm's Contribution to Energy Security

21 Based on a 700 MW capacity, the Development would represent an increase of approximately 7 per cent over the latest estimate (Scottish Renewables, 2017) of installed renewable electricity capacity in Scotland and a 2.7 per cent increase for the UK (DUKES, 2017). It also represents 0.34 per cent of the Scottish Government's estimated total offshore renewable electricity potential (of 206 GW, Scottish Government, 2011). The Development is expected to generate in the order of 2,324 GW hours of electricity per annum which is approximately equivalent to 7.5 per cent of current (2016) Scottish annual electricity

consumption (BEIS, 2018). 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 Development 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 10,000 full time equivalent (FTE) (Aura, 2017), and could create up to 21,000 direct FTE jobs by 2032 and almost 60,000 FTE jobs overall if indirect and induced jobs are included (Aura, 2017). The latest statistics show that currently in the EU there are 75,000 FTE jobs, and it is estimated that there will be 178,000 FTE jobs by 2030 within the European offshore wind industry (European Wind Energy Agency, 2015).

31 In 2010, the Scottish Government published *Scotland's Offshore Wind Route Map* which stated that the offshore wind industry in Scotland has the potential to provide 28,000 direct FTE jobs by 2020 (Scottish Government, 2010). Survey results as published on the Scottish Renewables website estimates that in 2016, 2,000 people were employed in the offshore wind industry in Scotland (Scottish Renewables, 2018).

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, 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, 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 Inch Cape Wind Farm's Contribution to the Economy

35 To date, ICOL has spent over £50 million, the majority of which is within the Scottish economy, on the development phase of the project.

36 At a Scottish level, the Development would create between £55.8 million and £136.2 million GVA in the construction phase, between £10.3 million per annum and £18.6 million GVA per annum in the operation and maintenance phase. Full details of this are outlined in *Chapter 16* (see *Section 16.8.1 and Section 16.8.2*).

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

38 Employment creation within the Economic Study Area[2] is estimated to be as follows, with full details of this outlined in *Chapter 16*:

- Construction Phase – Creation of between 321 (base case) and 832 (high case) direct, indirect and induced FTE jobs (see *Section 16.8.1*);
- Operation and Maintenance Phase – Creation of between 38 and 83 direct, indirect and induced FTE jobs (see *Section 16.8.2*); and
- Decommissioning Phase – Creation of 110 direct, indirect and induced FTE jobs (see *Section 16.8.3*).

39 Employment creation at a Scottish level during the construction phase is estimated to be between 429 (base case) and 1048 (high case) FTE jobs and at a UK level, between 858 (base case) and 1,854 (high case) FTE jobs (see Table 16.9).

40 As well as jobs being created, there is likely to be capacity strengthening measures implemented across the UK in the form of education and training infrastructure and initiatives necessary for the provision of up-skilling and the transfer of skills required to accommodate the offshore wind industry. 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 Development will support and utilise the skills and training provided.

[2] See *Chapter 16* for more information on the study area.

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